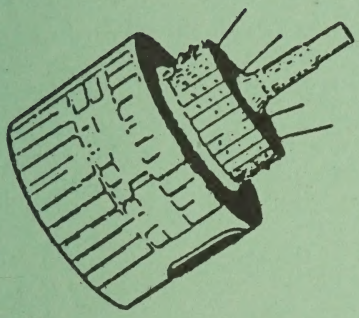
NEWSLETTER No. 25



REMOTE IMAGING GROUP

JUNE 1991

REMOTE IMAGING GROUP.....OFFICERS 1991

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JUNE 1991

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CHAIRMAN'S WAFFLE

I have pleasure in introducing three new members who have been co-opted onto the committee. They are all in for hard labour and will not be allowed to escape very easily. The first one really needs no introduction because most of you will have heard of him or seen his products. James Brown from Porthcawl has agreed to take the post of Newsletter Editor. This post is not quite the same as we have operated in the past, we want you to funnel all articles and material to James so that he can organise that side of it. The actual make up and assembly has been separated from this job and is to be done by Mike Goodall who used to be employed in the typesetting business. James will have the normal editorial page, at the beginning after this issue, but for this issue only his page will come after the waffle. I continue to do the proof reading, printer liaison and dispatch. By reducing their workload I hope that we can make the job less arduous and more fulfilling. The third person to introduce is Mark Clarke who is the managing director of a produce company at Halstead in Essex (may I quickly point out that his products do not have anything to do with any that I produce). He has agreed to take on the post of treasurer. This post has been vacant for several months and after the statement from Chris Harwin in the last Newsletter, I am very relieved to have this post filled. Mark will give you his own comments on how the Groups affairs are now being handled etc.

We still do not have a Secretary as we originally knew this post. I have been thinking along the lines of splitting this post into smaller jobs. This would enable someone to be able to take on just a small part without being overwhelmed. Present suggestions are an enquiry secretary and a product secretary. If this post is split up into different categories you could then address any enquiry to the correct person and it might be dealt with much more quickly. John Tellick has offered to take the enquiry Secretary side on for a trial period. John can handle some of your queries but for the more difficult ones he has other people that he can put you in touch with. John Tellick can be contacted by telephone only for the present 0813 903315.

R I G Binder Postal orders are handled by Gordon Fleming. When they were originally supplied to us, it was obvious that if one person could be responsible for their dispatch it would make life a lot easier. Gordon Fleming offered to do this and is dealing with all postal binder orders. We had sold them all, but fresh supplies have just arrived! We shall also be selling them at rallies, but all postal orders should be via Gordon.

These last few months have left me rather exhausted but still ready for your calls and letters. I must thank you for some of the calls etc. that I've had. When things are not as they should be, a little encouragement does you the world of good. I have tried to reply to all correspondence in some way, either with the goods you want, or a phone call if things are not straightforward, as quickly as possible. Often goods are sent by return of post if there are no problems. I've tried to make amends for inaction in the past and get things moving. RIG24 was a large task but just doing it proved that even Henry could do it if required! However after it was posted I did get rather a large mail and even I cannot reply to 20 letters a day! Fortunately this didn't last for many days and I think that I am now catering quite nicely. It has however meant that any work or projects have taken a back seat and there is not much to report this time in that respect. The LNA kits should now be available and if we do get sold out of the first batch mk2 they should be quickly re-orderable.

I have purchased a BLUE LED for over £10 but after having seen the light output (15 milli-candela) I doubt if it will affect the photographic paper more than 10% so it is still a case of waiting on that score. If they get up to 500 or more milli-candela we shall all be placing our orders! In the meantime I have been pursuing the fibre optic acoustic switch. They are used in several products and will probably be much cheaper in the future. They are used in some laser printers to switch the beam on and off. They comprise of a crystal in direct contact with a optical fibre. When the voltage applied to the crystal changes, it changes its size and the pressure on the fibre. This results in a variation in the amount of photons passing down it. There are other devices which do a similar job in a variety of products. If any of you know of a similar device that will work at sub millisecond speeds please let me know. I know that some of you work at places like Martlesham and Malvern so I look forward to hearing from you.

Some of you might have seen the nice prints that I have had at recent rallies. They are much better than the hpdump type included in the last newsletter. They are produced by using the Piclab program. Piclab 1.81 is a public domain image processing program by Lee Daniel Crocker and the Stone Soup Group. It can print a picture using a HPlaserjetII and with adequate memory, fill a full A4. It is not quick and often takes as long as 6 minutes to complete one. It uses a dot dither principle and gives as many as 32 grey levels. The dot pitch on the laser printer is 300 per inch and I thought that our printer at the Isle College would not be able to reproduce these at this resolution. If they can we might be able to insert items directly into the text. This will possibly be done by the use of either a flat bed

scanner or a smaller hand A5 scanner. Either way if we can do this it will enhance our newsletters. The only problem that I can see is that the printer uses an ink that is not jet black. It is an oil based product and is only say 90% black so we are not home and dry yet.

Another logistical item is the rearrangement of the Late News Items. With good co-operation from the printers this still results in rather a long period from last chance at the printers to their dispatch to you. I have my own photocopier and will now print this insert myself so there will be no lead time at all except at the actual time of dispatch. Any emergency items like last minute Keplers and News items I should now be able to be include right up to the last moment. It might not be excellent copy but is in my control. It may not be fast but it is still faster than we can get the newsletters into the envelopes.

Hopefully we have caught up a little with this Newsletter and we will try to do the same for the next one. It is always easier to let time slip by than to catch it up! However most of the Rally season will be over by the time you read this with the exception of Leicester (Granby Halls). I have had some complaints that we don't let you know which rallies we are attending. The rallies that we have attended this year are Pickets Lock, Sandown, Harlaxton (BATC), Harrogate, Elvaston Castle, Longleat, York and Woburn plus Leicester already mentioned. I will not be attending Harrogate next year but I have attended the York rally this year and that might be a replacement. Now you know, but it only takes a phone call to confirm if we are going. Mentioning phone calls reminds me to thank those of you that now include your phone number in correspondence. It definitely helps if there are any problems and saves me 43p for a directory enquiry!

I believe Mike is putting a request elsewhere for someone to help us with a circuit drawing facility. I don't wish to duplicate his words but it would be nice if someone local to us offered to redraw circuits. We are often given (at the last minute) rough pencil sketches which just aren't good enough to print. If we had someone that we could hand these over to, and out popped a crisp ink just-dry end product it would make life a lot easier. Most of the packages that I have seen need a doctorate just to read the instruction manual!

You may have noticed that we have a vacancy in the Schools liaison department. I haven't found anyone to take this on but I have had several offers to help people in their area. In the forefront here must be John Murray, who lives at Brixham, Devon. John has several satellite packages including the Graphstore from Martelec for use on

a BBC, Dartcom/BAe for an IBM PC, DIGISAT for an IBM PC, and off course PCSAT3. Images and data is available on the county data network free, or countrywide for the cost of disks and postage. He could help many of you that are starting on the weather Satellite scene. The problem is that he lives near to one extremity of England and is therefore only readily available on the telephone. That is of course unless you want an excuse to visit that part of the countryside! John Murray, C/O Perry Data Centre, Room 714, South Devon College for Arts & Technology, Newton Rd, Torquay S. Devon Tel: 0803 217490.

Nearer to London, well to the SW and also West are two other offers of help. Frank Bell, from the Royal Grammar School at Guildford uses the Dartcom Nimbus system as well as PCSAT3 and is willing to help anyone in range. F K Bell, Coturnix House, Rake Lane, Milford, Godalming, Surrey. Tel: 0483 416897.

Not too far away is Tom Walter who specialises in the Archimedes computer system. He is already using their Archimedes 420 + Spacetech Podule system for geography and meteorology teaching and will incorporate it into National Curriculum courses in the future. T. D. Walter, 19 Sycamore Rd., Reading, Berks., RG2 7LX. Tel: 0734 871330.

I hope that in later Newsletters that there will be a list of additional offers of help.

At present we have run out of the 1 meter dishes. They have been quite expensive and we are assessing if we should find an alternative source or use a smaller one like those used in DBS systems. If we can find something that will do the job we shall soon have them in stock, however for the time being we are out of stock.

I have had several complaints that the newsletter is "too technical" from those who have just learnt how to switch the soldering iron on, or there aren't any good "state of the art articles in this time". This time it will be "all HRPT and nothing for me" complaints. We really do need you to send articles in to give us a wide range to include in the next one. They obviously need to be weather satellite orientated but that does cover a wide range of skills in itself. I can assure you that there aren't many that don't get included. Later in this Newsletter there is an article about the Amiga 500 and the Amigasat package. **Please note** that this is for those of you that already own an Amiga. We do not suggest that the Amiga produces the best results at present and that you should buy one. This is purely for those of you

that already have one. If you are contemplating the purchase of a new system may I suggest that with the present day costs of even a 286 being similar to of an Amiga, you should evaluate any purchase very carefully. The cost of an Amiga and monitor (max 16 grey levels) plus extra memory soon adds up to the cost of an IBM compatible PC which can have PCSAT3 added and give excellent pictures (64 grey levels or 255 colours). This machine will not give any audio quality at all and the only machine that can do that well is of course the Amiga. So if you want sounds with your pictures then the Amiga does both, but if you only want pictures then a IBM compatible is still the best.

I need to upgrade my own PC to possibly a 386, but because I already have a 3.5" HD drive, the Pro-designer VGA board (ET3000) and a Tystar monitor this should reduce the total cost so that even Henry might just be able to afford it. The Group is also in the market for something like a 486 for future work. The present 386 will probably be used on the EBB when we can get around to it. If any of you know of a "economical product" please let me know. We are willing to "pick and mix" if you know of parts. It seems unwise to have 3 386s, because in just a few years they will probably have been superseded by XXX!

I cannot believe that the chairman's waffle is only five pages this time! He must have been busy doing other things. Perhaps getting 10 to 15 phone calls a night has something to do with it! Never the less it is nice to hear from you and it is a lot easier and nicer than having to write. Mind you, if you know what Henry's handwriting is like it is a definite advantage having a printer on the end of the word processor. I would also like to point out that it will soon be Henry's busy period and even I have to work hard at such times! I shall still be available but the hours might be very restricted at times. Once I get through this busy period, I hope to return to normal service ASAP. I will try and get orders dealt with as soon as possible but this can only be achieved on straight forward orders. Please keep things as simple as possible so that I can use my limited time as effectively as possible.

While you are watching those good cloud free pictures Henry will be causing a cloud of dust or smoke thats just a little bit smaller than pixel size! I'm sure you will sympathise with me!

Best Wishes Henry

FROM THE EDITOR'S DESK...

There are two lessons I should have learned by now!

1) That you should never stay away from important meetings of your society, sooner or later it'll end up in more work for you!

2) I should have put the 'phone down on Henry right at the start of a conversation a few weeks ago. He was in one of his most persuasive and ebullient moods, and I knew half-way through the call that I should have pleaded insanity or some other severe disability, but by then it was too late. Open the door just a little, and with Henry on the other side, it's not just a little for much longer! And before you write in, yes I know I'm not alone! Hence I now find myself with a new item on my desk - it's marked 'editor's in-tray'!

So, as one who is taking over from another, I believe my first task is to express, on behalf of all who read this publication, our sincere thanks to Phil Seaford who for so many years has almost single-handedly been responsible for its production. We have all valued his discrete but effective editorial judgments, his professionalism and his friendly availability to all who needed his help, often I'm sure to the detriment of his family life. I can only hope that the work of myself and others who will replace him, will be of the same calibre.

As we have looked afresh at the job that Phil was doing as magazine editor, we have felt the need to approach it in a slightly different way and to put together a small kind of magazine 'team'. Chief among those is Mike Goodall, who will be occupying the 'compositor's chair', and I have a feeling that he may well have nodded in agreement with my opening remarks! We're grateful to him for responding in this way, and he brings real expertise to this position.

My own role (If I have understood Henry's 'job description' right!) is to virtually act as the 'in-tray' man, so that means from now on articles and letters intended for publication should be sent to my address.

We hope by this new approach (after we've ironed out any teething troubles), to get what is arguably the best Remote Imaging magazine of it's kind in the world, to you in a more streamlined way. So from now on we hope to keep to the deadlines! We feel that this is important because the world of satellite imagery is often a fluid and fast-moving one, and as we are involved in what is in reality the frontier of space technology, we need to keep as up to date as

possible. That at any rate is our aim!! It may be possible eventually to further speed things up by modem technology, but you'll have to watch this space for more news on that front.

Lastly, a few comments about this issue. It's clear that the world of High Resolution imagery is fast opening up to the amateur. This year NOAA HRPT and Meteosat Primary data - next year who knows? Raw data? Landsat? Seasat? Yet we need to remember that others will just be getting into APT for the first time. RIG has always been a blend of those who are beginners and those who are 'old hands', those who just dabble as a hobby, and those who are the 'professionals'. Having occasionally served behind the RIG stall at rallies, it becomes clear what a happy blend that is. We will continue to reflect that mixture in coming issues, and hopefully you the readers will help us to get the right balance by the kind of letters and articles you submit.

Well I trust that many of you will be able to enjoy a break this Summer.. and one thing's for certain, we may be able to watch the weather, but we sure can't change it!

Cheers, James Brown

FROM THE MAKE-UP EDITOR

Just a line or two to re-iterate Henry's comments on the Newsletter staff and its aims in the future. We hope to catch up in the next few issues, but can only do it with your help. Please write those articles as soon as possible after you receive this one, and get them posted off to James Brown. If you set them on a computer word-processor send us the files on disc (most formats can be handled, but let us know what they are!). This saves an immense amount of time. Remember to include a print-out as well, in case we have difficulties with the files. If you haven't a wordprocessor, don't worry. We still need your articles, even in manuscript form. If you have diagrams to go with them, please draw them in pen-and-ink (pencil is difficult to copy well), and do them two or three times the size (we will clean-up and reduce). We hope to introduce a deadline date in the future, to speed up publication; 4 weeks after distribution seems reasonable.
Greetings, Mike Goodall.

FROM THE TREASURER...

"Dad it's Henry on the phone again", a sound heard daily in our household during April and May. To think it all started with an enquiry to Henry to find out whether PCSat3 would run on my old IBM PC XT. Don't mention you've been a Treasurer before!!

Henry invited me to look over the accounts and although not an accountant I have run my own Food Processing business for 12 years and have a reasonable ability in understanding the difference between a debit and a credit.

Those of you who read RIG 24, page 50, will note Chris Harwin, the auditor's, remarks, in respect of the 1990 accounts. In essence they needed a complete revamp and to be put on a more business like footing considering the present size of the group.

After accepting the appointment I have now brought the accounts within tight financial control and I am pleased to report a healthy position.

Thanks go to Chris Harwin for a splendid job in interpreting the previous accounts and to Henry for increasing my telephone bill by 50%.

For the record I have been imaging in North Essex for about four years. I have built the Maplin Polar System and have recently added the Dartcom Downconvertor and RIG dish for Meteosat. The purchase of Pcsat3 has for me transformed a marginal system to one of impressive performance.

Must go now "Dad it's Henry on the phone!"

Mark Clarke, G3CQL

FOR SALE OR SWAP:

Two BBC Digitizers
One Watford Electronics £40.00
One Gladstone Electronics £50.00
86 Parsons Lane, Littleport, Ely, Cambs, CB6 1JS
Tel: 0353 861475

1991 A G M

Minutes of the AGM held at the Sandown Rally on the 24th. March 1991.

Prior to the AGM itself Phil had produced an Agenda. Included were certain items that were strictly not accurate. In any case these items amounted to a rule change. A minimum of 28 days notice is required for this. That Agenda had been shown to another committee member prior to the chairman seeing it. When the chairman first saw this Agenda, his initial reaction was that certain items were not accurate and others required the 28 day notice. Those items would have to be raised under AOB. That unofficial agenda had been distributed without the chairman's consent.

The AGM itself started without anybody having a copy of the minutes of the previous AGM. They are in RIG21-P41. Matters arising was a bit difficult to hold because of this. The chairman then reported on the last 12 months activities. The secretary started his report by mentioning the problems that the committee was having at that time. The chairman asked him to confine his comments to what had happened during the preceding 12 months (he should have raised the committee's problems under AOB). He declined to give any report. We then went onto the Membership Secretary's report by Dr. Des Watson. He reported that he was catching up with the backlog of renewals and hoped to be up-to-date soon. Membership seemed to stabilise around the 1050 level, we loose some, we gain some, but everybody was reasonably prompt in renewing. Next should have been the Treasurer's report, but because we didn't have a treasurer or a set of audited accounts, it was not possible to cover this item. Audited accounts were included in the next Newsletter. The next item on the unofficial Agenda was the proposed rule change. This item didn't meet the 28 day ruling and would have to be covered under AOB at the end.

Nomination of the new committee. Many of those present were by then aware of problems. The chairman explained, as well as he could, the situation as he saw it. He had received a letter, nominating Dave Cawley, from a well known member, but it was dated later than the required date (1st March), alternatively he knew of someone who was prepared to support this nomination. The meeting was able to accept either. He also had a letter from another well known person who wished to second Mr Cawley's nomination, or the chairman would second it himself, (he thought it was the chairmans duty to do so in these circumstances). He also had a letter accepting

nomination and accepting election if so elected. This brought the committee's problem into the open. We have rather incomplete notes on the actual nominations and these minutes have been generated from the material available. These notes show that the following were nominated and seconded to the Committee :- Dave Cawley, Des Watson, Gordon Fleming, Les Currington, Mike Coombs, Henry Neale, Ray Godden, John Tellick and Peter Newman (the names of the nominators and seconders are known but they have been omitted from these minutes). One member from the floor wanted us to vote on these nominations individually, but because the meeting was running 10 minutes late and the next group were waiting to use the room, the chairman accepted a proposal and a seconder that the nominations be taken en bloc (which we have done most years previously). This was accepted. Previous committee members Phil Seaford, Dick Boardman and Ian Gurton did not wish to stand for re-election.

MEMBER'S LETTERS

Dear Editor,
I have one request, which I hope you might publish in the Newsletter. I am looking for some paper for a Siemens fax recorder. I cannot find a model number on it, so I will try to describe it. It is a fully automatic IOC, scan rate, auto start/stop, is about 30" x 18" and about 8" tall. It uses a silver (metallic) paper in rolls about 20" wide. I wonder if anyone can help me. It was removed from service on a German merchant ship. The machine works great and I would like to put it into service, if I can find the paper. Thanks for any help.
Don Bremer, KB6LO, RT.4, Box 339, Joplin, MO, USA, 64804.
Tel Ph. (417) 623-6170.

Dear Editor,
With reference to Les Hamilton's article "Weather Pictures from the Screen" (RIG24). The film I use for B&W static TV pictures (i.e. computer displays) is Kodak's 2415 film, which can be used between 25ASA and 100ASA [200ASA if really pushed, Ed], developed accordingly. I also use it for Solar photography for it's high contrast. It can be bought in bulk form. As for photography off the TV I use an Olympus OM2N (circa 1982) and just set it on Auto and f11. The exposure usually takes about 5-10 seconds in a darkened room.
John Fairweather, Surrey.

FRAMESTORE or COMPUTER ?

Peter Hayes, GM3RAO

With the emphasis in recent issues of RIG on the use of computers in our hobby I thought it would be interesting to summarise the pros and cons of computers and framestores.

In the "good old days" all Weather Satellite pictures were reproduced using Fax machines usually on electrosensitive paper and this is where the APT transmission format comes from. It is only in the past ten years or so that digital memory has become cheap enough to allow TV type displays. The first home computers were far too slow and had too little memory to give anything other than a rudimentary image, and framestores were developed to provide a better alternative. Even the ubiquitous BBC micro so popular a few years ago is not capable of giving a decent picture largely due to its limited memory. However, in the past few years giant strides have taken place in computer technology and now computers with 4 or 8 Megabytes of memory running at 8 or 16 MHz (and even faster) are readily available, frequently described as a "PC" or "Personal Computer", based on the format developed by IBM and now cloned by a number of manufacturers.

It can safely be said that anything a framestore can do a decent computer can do at least as well, but the reverse is certainly not true! Framestores such as the YU3UMV, and the David Woods one published in Rig recently give excellent results but are generally limited to black & white images, ie, no false colour, and do not offer any image processing. Some top of the range framestores offer false colour images, and sometimes grey scale processing and animation, but any detailed processing such as edge enhancement or comparison of different imaging channels needs some form of computer. Archival storage of the on screen picture comes built in with today's PC, but the only way to archive using a framestore is to record the audio signal from the receiver, and even this is not possible with the digital modes which are of increasing interest.

One advantage here of the framestore is that because they generally give standard 625/50 TV pictures you can record your results on a video for later playback to family and friends, or maybe the local school or club. You cannot record the picture on a PC display; it is highly non-standard and even if you got an acceptable video signal out of the computer the VHS wouldn't want to know as the line and frame rates are hopelessly wrong. You can of course print out the image from the PC if you have a suitable printer, but the quality can

leave a lot to be desired with limited grey scale for example; very disappointing to anyone used to the 256 of your average framestore.

The framestore would have died out long ago and we'd all be running computers now but for one snag - cost. A framestore can be built for around £100 plus some effort, and the only addition likely is extra memory, but even that need not be too costly; 1 Meg of static ram can be got for about £100 and this will store most of a NOAA pass; do it in dynamic ram and the cost falls to around £50. However, you will have little change out of a grand if you buy a decent PC with a hard disc and SVGA graphics with monitor to match. Of course there are the lucky ones who can justify the investment in a suitable PC as a business expense, or who have access to one through their work, for them the choice has already been made. For the rest of us we have to decide whether the undoubted benefits of investing in a computer can be justified, always remembering the hidden extras, for example the hardware and software needed to turn the computer into a Wxsat system doesn't come free from the PC manufacturer but is an extra that will alone cost at least as much as a framestore.

This, it seems to me, is the snag with all those systems so enthusiastically described in Rig; they all assume the reader has access to a PC or equivalent (Atari, Arc, etc). You can spend several hundreds on an all singing all dancing APT system, or up to £1000 on an HRPT setup, but they aren't much use if you haven't already spent £1000 + on a PC. In essence the choice is made by money; if you have enough to spare, invest it in a decent PC (see Dave Cawley's article in Rig 22), buy the software of your choice and hopefully you will get facilities and results undreamed of only a few years ago. If you can't spare the cash a framestore will still give excellent results provided you understand its limitations, and you could also get the satisfaction of "rolling your own" if you so wish. As to value for money, that's up to the individual to decide!

FOR SALE:

Optical components for anyone contemplating building a photographic system. Lenses, prisms, mirrors, etc.
Phone Mike Goodall on 0353 860646 for list, or send a S.A.E. to 2 Meadow Court, Littleport, Ely, Cambs. CB6 1JW.

INTELLIGENT SQUELCH FOR RIG RECEIVER

Richard Gedge

I have owned a RIG scanning receiver for approximately 3 months and have been very pleased with it's performance both in terms of sensitivity and rejection of paging interference. However, a scanning receiver that uses only signal level for 'scan stop' makes unattended operation unreliable. Spurred on by Colin Schutz's article in RIG 23, I decided to remedy this situation. I ruled that any mods to the receiver should be made with the minimum of alteration and would not involve removing the circuit board from it's case. I achieved both aims with the following circuit and vero board layout.

Circuit Description

The complete circuit is shown in figure 1. The circuit is based upon the NE567 tone decoder IC, tuned to detect the 2400/2500Hz APT subcarrier. The circuit input uses the squelched audio signal to operate the tone decoder only when a signal is present, this improves the immunity to noise. The Op-amp, chosen for its ability to run from 5V, amplifies the signal to provide approximately 200mV p-p signal at the input to the tone decoder. The tone decoder output goes low on detection of the subcarrier tone and is inverted to provide an active high signal. The output is then used to trigger the existing receiver delay circuit which in turn disables the scan clock and operates the tape recorder relay. A switch can be added as shown to disable the circuit if required.

Construction

The circuit was constructed using 0.1" veroboard 22 strips by 11 holes. The component layout is shown in figure 2. The veroboard requires track cuts to be made between the pins of all IC's. All the parts except the wire wrapped IC socket can be obtained from Maplin Electronics and are not critical although size should be considered, especially the cermet presets. The wire wrapped IC socket can be obtained from Radio Spares or other supplier's (I obtained mine form the local component shop). There is no specific construction advice but I would advise the use of IC sockets and be careful not to bend the legs of the wire wrapped IC socket. Once construction has been finished the wire wrapped IC socket requires three of its legs to be removed (ouch); Pin1, Pin2 and Pin 8. Make sure to get this right!

Inserting into the receiver

The circuit connects into the receiver via the wire-wrapped IC socket. This provides power and all connections apart from the audio input.

Remove the 4011 chip from the receiver board, this can be located between the Framestore level pot/op-amp and the page selection switch. Plug the removed 4011 IC into the new circuit board noting orientation. Now plug the complete board into the vacated socket on the receiver PCB using the wire-wrapped IC socket, this is quite a tight fit. The audio input is taken from the link used to select either squelched or un-squelched audio for the framestore output. Select the squelched audio pin and solder a short length of wire to the circuit input, screened cable is not necessary. Installation is now complete and the board can be set-up and tested.

Settings up and testing

Carefully check all connections before switching on the receiver. Turn on the receiver and check that the 5V rail is still at 5V, if not turn off and check connections. If the disable switch has been fitted then the closing of this switch should disable the modification, if it doesn't double check circuit and connections. Ideally the pots should be set-up using an oscilloscope and frequency counter but the following procedure may be used if they are not available. Set the gain pot to halfway. Wait for a good pass of NOAA and once a clear signal has been obtained adjust R5 until the output from the 567 goes low (pin 8), ie. tone detected. Keep tuning the pot and establish the two detection limits, then set the pot into the middle of the detection band. If the 567 does not respond try increasing the gain of the op-amp by increasing its pot value. Once the 567 has been calibrated wait for another NOAA pass (or the end of the current one) when the signal level is just audible, now adjust the op-amp pot until the 567 detects the signal. Too much gain doesn't really matter although noise immunity will be reduced.

Operation

When the receiver is operational any signal now defeats the receiver squelch and the signal can be heard on the speaker, if a tone is also detected the relay operates and the scan stops, if no tone is detected the receiver carries on scanning to the next channel. The squelch can now be set to a minimum value to maximise capture time without fear of false detection.

Happy Scanning!

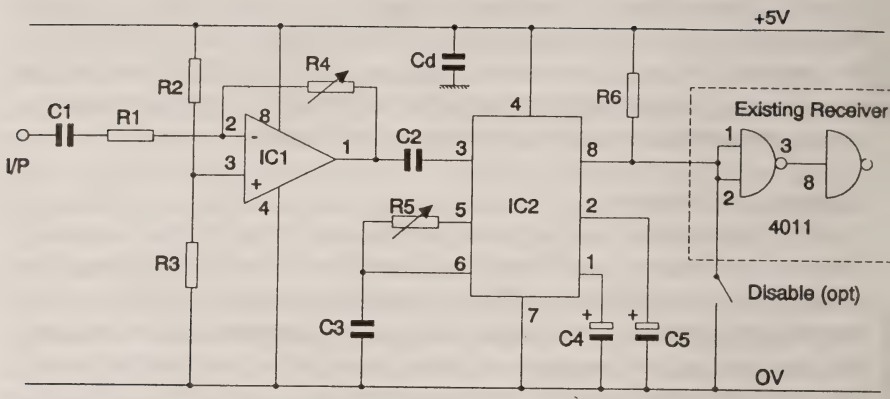


Figure 1. - CIRCUIT DIAGRAM

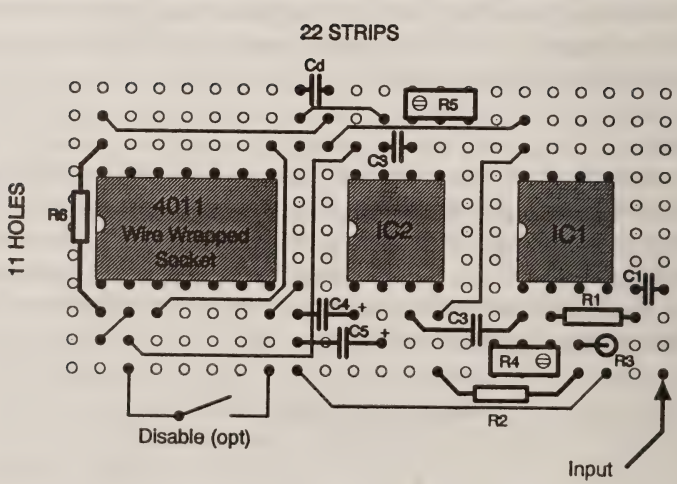


Figure 2. - VEROBOARD LAYOUT

Parts List

Part	Value	Description
R1	5.1K Ohms	0.6W metal film
R2	5.1K Ohms	0.6W metal film
R3	5.1K Ohms	0.6W metal film
R4	100K Ohms	22 turn cermet preset
R5	10K Ohms	"
R6	10K Ohms	0.6W metal film
C1	0.01uF	Monolithic Ceramic
C2	0.01uF	"
C3	0.1uF	"
C4	10uF	16V Tantalum
C5	2.2uF	35V Tantalum
Cd	0.1uF	Monolithic Ceramic
IC1	LM358	Operational Amplifier
IC2	NE567	Tone Decoder
IC Socket	14 pin Wire-wrapped	

FOR SALE:

SEAGATE ST225 20MB hard disk drive, as new condition, very few hours use, £50.00 plus post. Tel: Bob Needham 0491 576906.

MEMBER'S LETTERS

Dear Editor,
I have now finished the loop yagi and am very pleased with it. The difference between the RIG dish and the yagi is very small and confirms all the favourable comments about it. Incidentally, in Payless DIY shops they sell for 51p a 3ft length of 1/4" seamless brass tube, and in Tandy they sell an N-type plug with a 1/4" sleave 1/2" long. The two mate together perfectly for soldering. For the inner I used some old coax minus the outer cover and braid. This slides down the inside of the brass tube. Instead of the 0BA bolt I used a small piece of 1/8" brass which I bolted to the boom, with a 1/4" hole in it to take the brass tube and soldered as indicated. It works fine.

John Wills, Romford, Essex.

AN HRPT RECEIVING SYSTEM

By Guido Emiliani I4GU,
Claudio Pagnani,
Marciano Righini I4MY

The APT receiving system we described in RIG 24 was thought of as part of a larger system including the possibility of displaying HRPT pictures. Now we are going to follow up that article with the description of a HRPT front end which is designed to match with most units of our previous APT receiving station. By switching the APT and HRPT front ends, one can choose between two types of environmental data acquisition that might both be useful for weather analysis.

Radio Frequency Section

We use a 1.4 meter parabolic dish with a f/d ratio of 0.38. The cylindrical horn is 17cm long and has a diameter of 12cm. Inside it there are two quarter-wave monopoles (probes) soldered to N-type coax connectors placed at the same distance (4.5cm) from the rear of the horn, 90 degrees apart. The monopoles are 4cm long. The combiner is a 2-way-90 degree ZAPDQ-2 manufactured by Mini-Circuits, P.O.Box 350166, Brooklyn, New York. It is placed at the rear of the feedhorn and is connected to the probe connectors with identical lengths of coax cable as short as possible (25cm in our case). The proper polarisation is left hand (the dish inverts the right hand polarisation from the satellite), thus, circling counterclockwise, the first probe you meet should be connected to input 1 on the combiner. The 1.7GHz low noise amplifier is the one described by Greg Ehrler and John DuBois in JESAUG, 1989-1. We assembled a kit supplied by RIG. The LNA is connected directly to the output connector of the combiner at the rear of the horn. The converter is a Microwave Modules MMK1691/-137.5. We replaced the original crystals with 86.69444MHz for 1698MHz, and 87.19444MHz for 1707MHz. The converter is placed on the mast supporting the dish. The coax between the LNA and converter is 4 meters long. A length of 20 meters of coax connects the converter to the receiver. The receiver is an ICOM IC R-7000 FM tuned on 137.5MHz for the NOAAs (the crystals on the converter should be switched to the proper channel) and 135.0MHz, low channel, for Feng Yun 1-B which transmits at 1695.5MHz. The R-7000 has an IF output at 10.7MHz to drive the TV Receive Adapter TV-R7000. We derived the 10.7MHz signal from the connection point between C19 and R9 on the adaptor with a 4.7n capacitor. The azimuth rotator is a YAESU G-400 RC and the elevation rotator is a YAESU G-500 A. As the beam width of a 1.4

meter dish is very narrow, we do not think that an automatic amateur tracking system would be able to aim the antenna with sufficient accuracy. After some practice manual tracking is easy. The signal strength should be continuously monitored on the receiver S-meter.

HRPT Decoding System. Block Diagram - Fig 1
The 10.7MHz input is amplified, filtered and demodulated in order to get a 665400 bit/sec split-phase low (Manchester) coded signal. Subsequently it is decoded into digital nonreturn-to-zero format. At this point the bits generated by the satellite (110900 per line) are available as a binary serial flow. 24 of them are paralleled and compared with the corresponding bits of the hardware-determined base address consisting of the last 24 bits of the 60-bit frame sequence transmitted at the beginning of each line. When they match, the frame sync (line start) flag is generated. Now it is necessary to signpost the words by generating a pulse at the end of each 10-bit word (word strobe). As the portion of the line bearing the image starts at word 751, a counter will signal when the earth data is available. On every line there are 5 images distributed in 5 multiplexed channels. Each channel consists of 2048 words, therefore storing the 5 channels implies the creation of a 55-Mbyte file for a 15-minute pass. In everyday work it is more practical to choose the desired channel beforehand and store only this one thus creating an 11-Mbyte file for a 15-minute pass. To choose a single channel we need a pulse every 5 words (sample strobe) as the 5 channels are multiplexed. A second counter signals the end of the earth data portion of the line and resets the whole system. From the PC we need a RD (read command) which tells register IC 23 when the computer is ready to accept the data. Adjustment, testing and troubleshooting in a system of this complexity is a considerable problem. A satellite simulator is a must so that you can rely upon a continuous source of split-phase data. Besides the simulator, the test equipment we used was a 10Mhz dual-channel oscilloscope and a frequency counter. The lower part of the block diagram shows the interfaces to the computer (Memory Buffer Unit and Computer Interface) and to the fax machine (D/A Converter, Analog Signal Processing Unit II and AM Modulator). These sections, as well as the Clock Generator, have already been described in our article "Storing Weather Pictures on Disk" in RIG 24.

10.7MHz Amplifier and Bandpass Filter - Fig.2
As the signal level from the TV-R7000 Adapter is in-sufficient, we need amplification to drive the following stage. The filter, consisting of T1, T2, T3 - small 10.7MHz IF transformers (FM1) - is a critical section of the system. The bandwidth should be about 1.5MHz at

-3dB. The simulator helps a lot, but the final adjustment should be made with the satellite signal.

Phase Demodulator - Fig.3

The type of modulation used for HRPT pictures is called split-phase low or bi-phase low or bi-phase Manchester. Manchester code represents data with phase changes of +/-67.3 degrees in the middle of the data cells. The direction of the transition indicates the binary value of data: a logic 0 is defined as a low to high transition, and a logic 1 as a high to low mid-bit transition. Manchester is a self clocking code as serial data stream contains both the clock and the data, with the position of the mid-bit transition representing the clock, and the direction of the transition representing data. Consequently there is on phase variation between the clock and the data. To demodulate the phase changes a fixed reference is required. The demodulator of fig.3 is based around a MC1496P, whose output, after passing though a low pass filter (IC4), controls the 10.7MHz VCO (TR2) which, in turn, provides the reference frequency to the MC1496P phase detector. With the values indicated the VCO capture range is considerably large, but it does not cover the Doppler shift of a 15-minute pass. Thus it is necessary to retune the receiver two or three times during the pass. The post-detection, low-pass filter, is designed to cut above twice the bit rate (1330.8kHz). A dual channel oscilloscope connected to the VCO and to the split-phase modulated input will show when the two signals are phase locked.

Split-Phase to Nonreturn-to-Zero Decoder - Fig.4

Nonreturn-to-zero code represents the binary values - logic 0 and logic 1 - with a static level maintained throughout the data cell. This means that NRZ does not necessarily give transitions; consequently it requires a clock so that the decoded bits can be shifted into an external register on every transition of the clock. The decoding process is based on a HD-6409/883 Manchester Encoder-Decoder (Harris Corporation), a chip which decodes Manchester code into NRZ code and provides clock recovery. It can also convert NRZ code into Manchester code. We used it in the latter mode for the HRPT Simulator. After being amplified by IC7, the s.p.l. data is fed into the decoder at UDI (Unipolar Data Input). SDO (Serial Data Out) provides decoded serial NRZ data synchronous with the decoder clock (DCLK). The decoder requires a clock with a frequency 16x or 32x the desired data rate. The rate is selected on the Speed Selector (pin 17) with SS low producing a 16x clock and high a 32x clock. We used the 16x mode to utilise a 10.7MHz IF transformer (FM1) connected across pins 12 and 13. The frequency of the free-running

oscillator should be 10646.4kHz so that it is synchronised by the incoming data (665.4kHz x 16 = 10646.4kHz) for its clocking. A frequency counter connected to the clock output (DCLK) is very useful to show when the internal clock is locked to the incoming data rate (655.4kHz). The clock shift from AOS to LOS is over 30Hz due to Doppler shift. $\overline{RST}$ provides control of the decoder outputs: when $\overline{RST}$ is low, SDO and DCLK are forced low. We have connected $\overline{RST}$ to the error signal in order to resolve the ambiguity problem. If a phase error ($\overline{frame\ sync}$) is detected by the Frame Sync Detector, the clock error generated is fed into $\overline{RST}$ so that the phase of the clock is changed by 180 degrees.

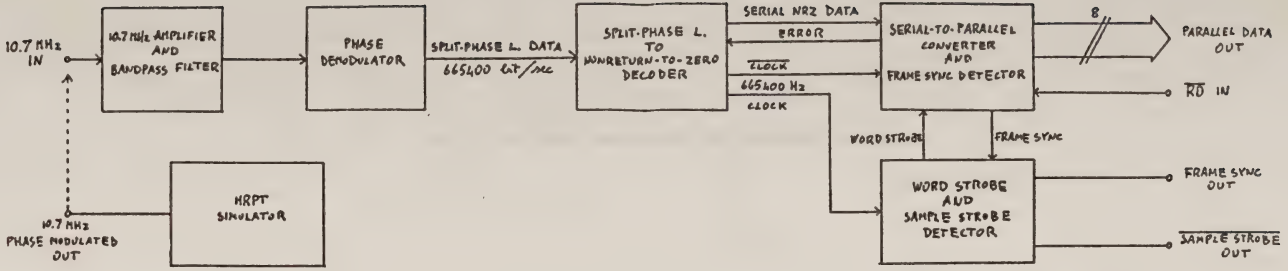
Serial-to-Parallel Converter and Frame Sync Detector - Fig.5
This board performs the serial-to-parallel conversion, generates the frame sync (line start) or the error flag ($\overline{frame\ sync}$), and interfaces the parallel data with the Memory Buffer Unit. The serial-to-parallel conversion is performed by passing the serial data through a 24-bit shift register (IC10, 11, 12) clocked by $\overline{clock}$. The board detects only the last 24 bits of the 60-bit frame sync sequence transmitted at the beginning of each minor frame (line). When the 24th bit enters the first register (IC10), a high (frame sync flag) is generated at pin 12 of IC22A. The board also detects the inverted sequence in order to resolve the ambiguity problem. The effect of a phase error is that the data appears inverted (0 instead of 1 and vice versa). This situation is detected by checking the serial data for frame sync as well as $\overline{frame\ sync}$ and correcting the clock if $\overline{frame\ sync}$ is found. This signal, generated at pin 6 of IC22B, is fed into the $\overline{RST}$ input of the HD-6409 decoder (IC8). The system makes use of the 8 most significant bits of the 10-bit word. The 8 data lines are derived from the last 6 outputs of the first register (IC10) and the first two of the second shift register (IC11). The bus is fed into a D-type register (IC23) which is clocked by the word strobe (a high at the end of each word). The register output is enabled by the computer by means of a $\overline{RD}$ signal. The 8 parallel lines, the frame sync and the $\overline{RD}$ lines are connected to the Memory Buffer Unit. The latter two lines should be separately shielded.

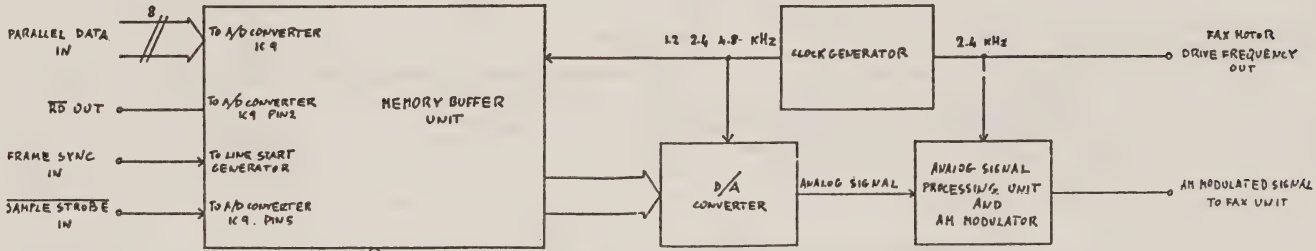
Word Strobe and Sample Strobe Detector - Fig.6
The frame sync (line start) pulse is fed into the CK input of IC24A (six times a second), Q goes high indicating that the data is valid. Under this condition the clock reaches IC26 which divides its frequency by ten, thus providing the word strobe (66.54kHz), i.e. a pulse at the end of each 10-bit word. The word strobe drives counters IC29, 30, 31, 32. The outputs of the counters are connected to both the inputs of the start comparators (IC33, 34) and those of the stop comparators

(IC35, 36). In fig.6 are shown the connections for: start at word 745 (the first word of earth data is 751 minus 6 frame sync words); stop at word 10984 (the last word of the earth data is 10990 minus 6 frame sync words). With these numbers the whole earth portion of the HRPT minor frame (line) is available. However there are other possibilities: for example, you may want to display only the central part of the picture in order to avoid the panoramic distortion. A good choice might be to display only the central 1200 words setting the start limit at 2865 and the stop limit at 8864. We have mounted a DIP switch for each Q input of the comparators to be in a position to select any number. The comparators provide a low pulse at the end of the count. When the start signal reaches IC24B, Q goes high, LED D7 goes on signalling that the system works, and Q goes low enabling divide-by-five IC28 whose 5 outputs provide the sample strobe, i.e. a pulse every 50 bits at the end of all words of one of the 5 multiplexed channels. The desired channel can be selected by means of switch S1. IC28 is reset after the fifth count. When the stop signal is generated, it clears both flip-flops IC24A-B. Frame sync and sample strobe are sent to the Memory Buffer Unit by means of shielded cables.

HRPT Simulator - Fig.7

The HRPT Simulator generates the frame sync sequence or better a part of it, i.e. the last 24 bits of the first 6 words of each frame (line). The sequence (110110000011110010010101) is followed by 32768 zeros (black) and 27232 ones (white). Then the cycle is repeated.The frame sync sequence is generated by three shift registers (IC37, 38, 39); the 24 bits are counted by IC40, 41, 42; on the 24th bit, flip-flop IC50 switches the simulator to the 60000x counters IC43, 44, 45, 46, 47, 48. The output is taken from the MSB line which is low for the first 32768 bits and high for the remaining 27232 bits. This nonreturn-to-zero sequence is fed into IC52, a Manchester Encoder (HD-6409) which provides the 665.4kHz clock (a 10646.4kHz crystal oscillator divided by 16 inside the chip) and the Manchester coded sequence at 665400 bits/sec. This signal is fed into a phase modulator (IC54, 55) whose carrier is generated by a 10.7MHz crystal oscillator. The output of the HRPT simulator, when applied to the HRPT decoding system, allows you to check the proper operation of the whole system. With the start counter (IC33, 34) set at 1 and the stop counter (IC35,36) set at 1200, a part of the monitor screen should be black and the rest white.





Inside the Memory Buffer Unit block there are the legends that are found on the left of fig.3A on pag. of RIG Newsletter No.24 and which indicate the connections with the A/D Converter and the Line Start Generator for the APT system.
The connections with the HRPT system are shown outside the Memory Buffer Unit block.

FIG.1 - HRPT DECODING SYSTEM - BLOCK DIAGRAM

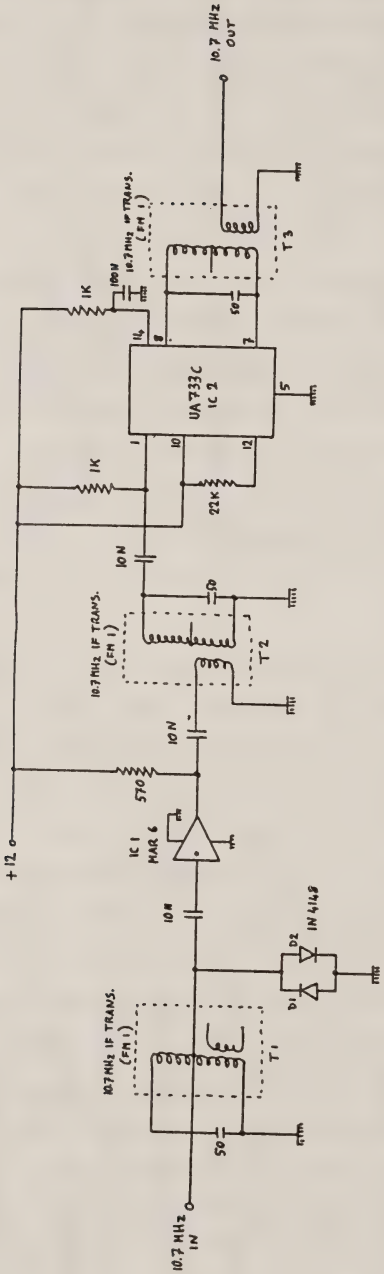


Fig.2 - 10.7MHz AMPLIFIER AND BANDPASS FILTER

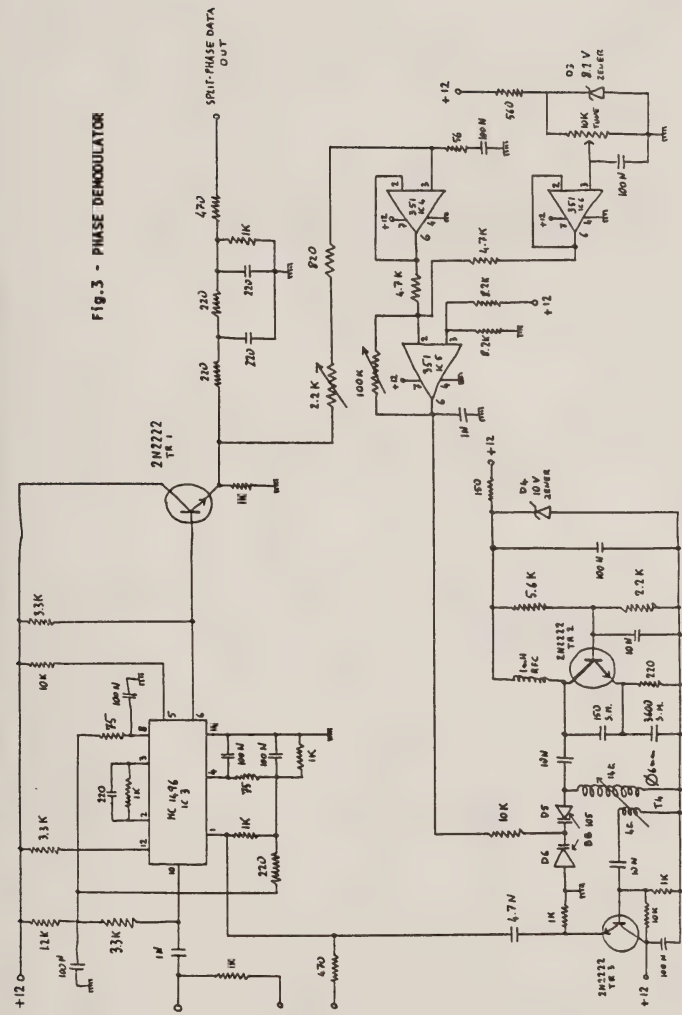


Fig.3 - PHASE DEMODULATOR

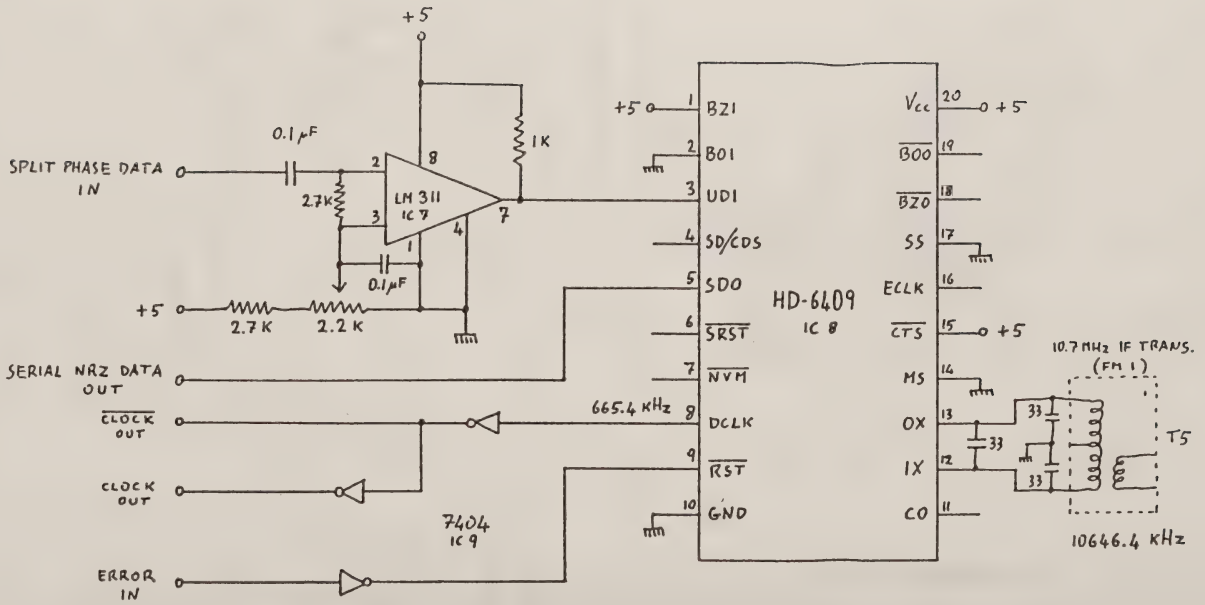


Fig.4 - SPLIT-PHASE TO NON-RETURN-TO-ZERO DECODER

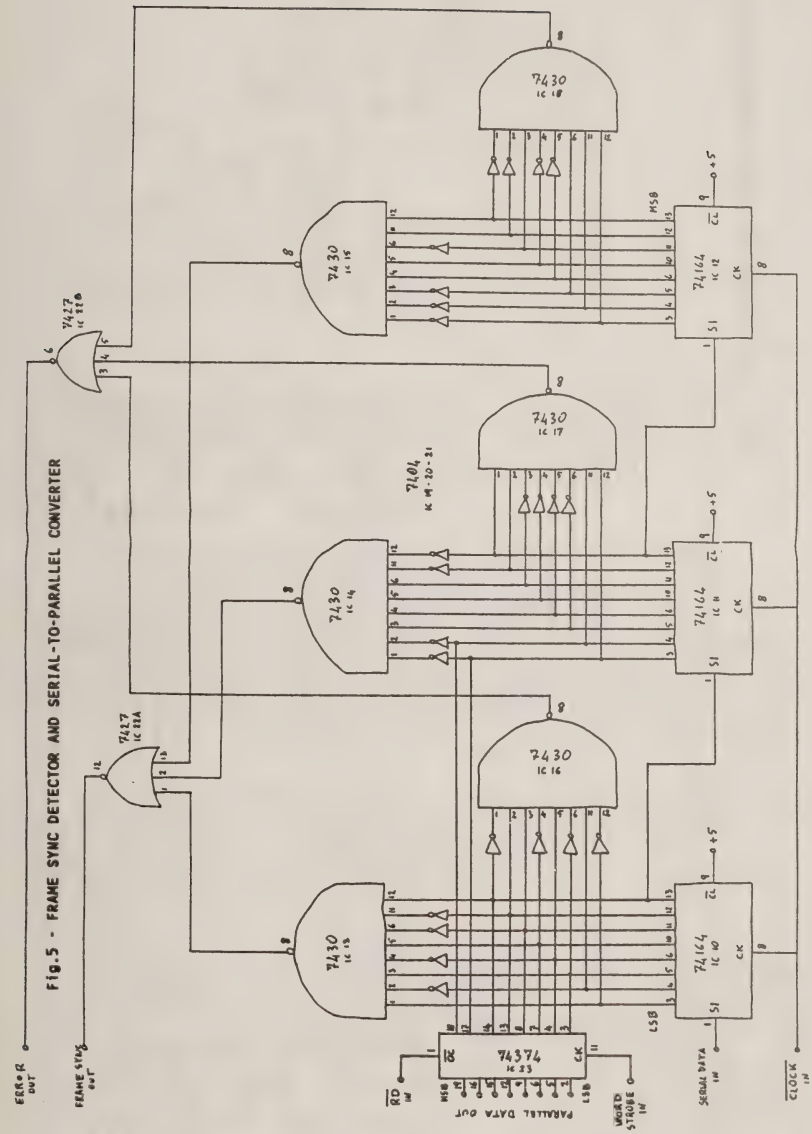


Fig.5 - FRAME SYNC DETECTOR AND SERIAL-TO-PARALLEL CONVERTER

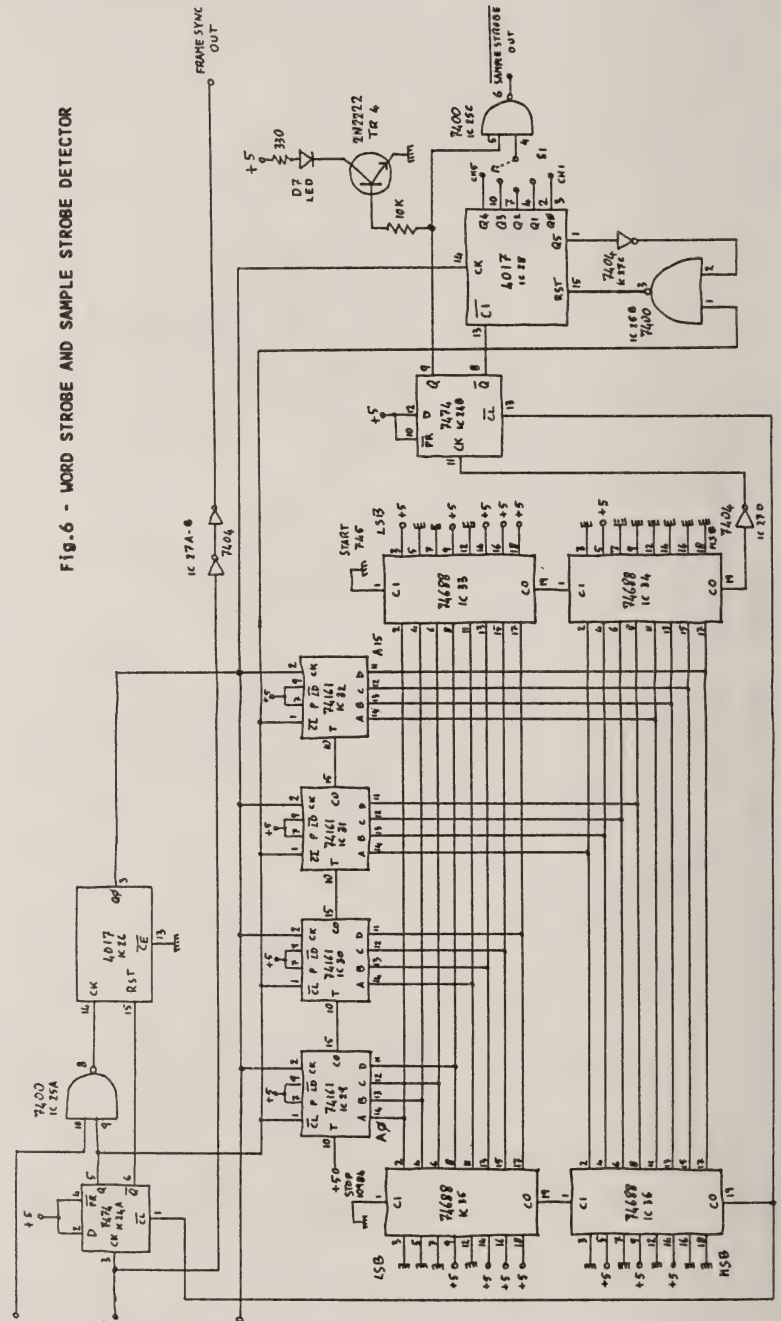


Fig.6 - WORD STROBE AND SAMPLE STROBE DETECTOR

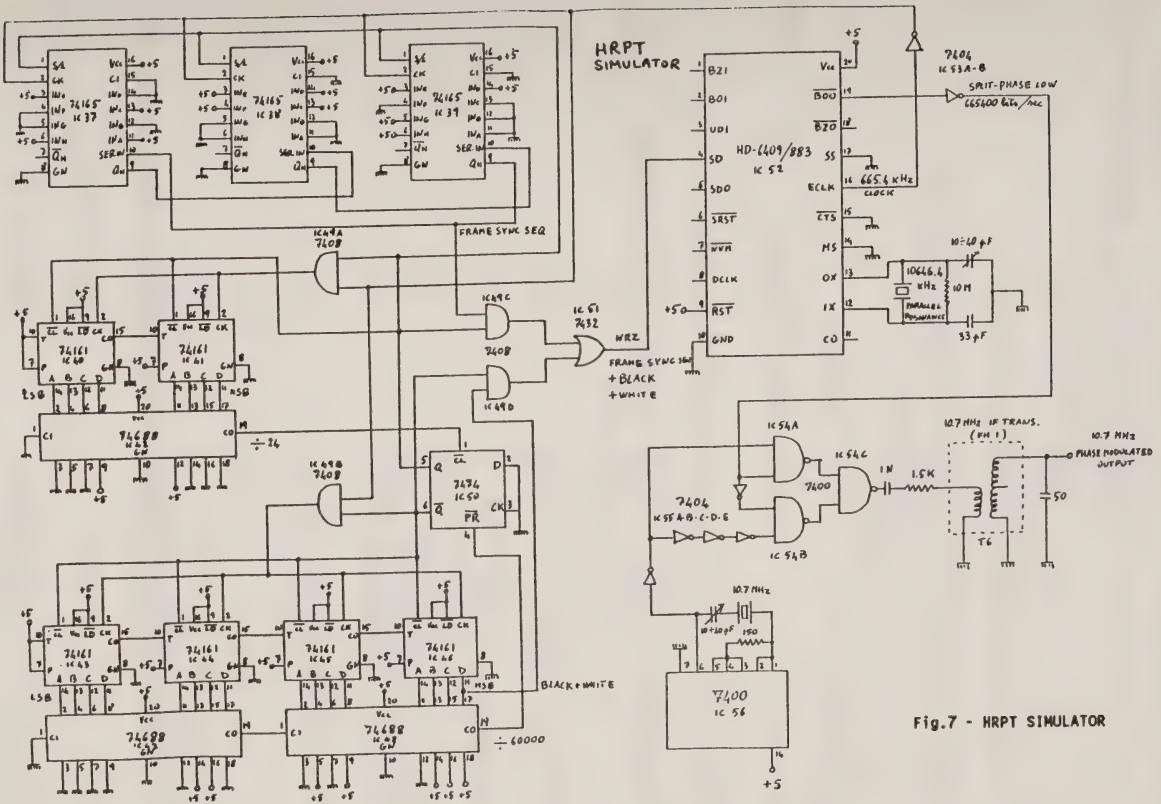


Fig.7 - HRPT SIMULATOR

TABLE 1
HRPT CHARACTERISTICS

Transmit frequency	1698.0MHz NOAAs TX on 137.50MHz 1707.0MHz NOAAs TX on 137.62MHz 1695.5MHz FENG YUN 1-B 1702.5MHz Back-up
Antenna polarisation	Right hand circular
Carrier modulation	Digital split-phase low, phase modulated
Modulation index	+-67.3 degrees
Bit rate	665400 bits per second
Frame rate	6 minor frames per second
Bits per word	10 bit 1=MSB (transmitted first); bit 10=LSB
Words per frame	11090
Scan lines per frame	1
Image samples of each channel in one frame	2048
Number of channels	5

TABLE 2
SPECTRAL CHARACTERISTICS OF THE AVHRR INSTRUMENTS

	NOAA	FENG YUN 1-B
Channel 1	0.58-0.68um	0.58-0.68um
Channel 2	0.725-1.1um	0.725-1.1um
Channel 3	3.55-3.93um	0.48-0.53um
Channel 4	10.3-11.3um	0.53-0.58um
Channel 5	11.5-12.5um (1)	10.5-12.5um

(1) - At present channel 5 repeats data from channel 4.

TABLE 3
HRPT MINOR FRAME FORMAT

Function	No.of words	Word position	Word code/meaning
			MSB LSB
Frame sync	6	1	1010000100
		2	0101101111
		3	1101011100
		4	0110011101
		5	1000001111
		6	0010010101
Telemetry etc.	744	7 to 750	
Earth data (1) (AVHRR)	10240	751	Ch 1 - Sample 1
		752	Ch 2 - Sample 1
		753	Ch 3 - Sample 1
		754	Ch 4 - Sample 1
		755	Ch 5 - Sample 1
		756	Ch 1 - Sample 2
		757	Ch 2 - Sample 2
		758	Ch 3 - Sample 2
		759	Ch 4 - Sample 2
		760	Ch 5 - Sample 2
		761	Ch 1 - Sample 3
		|	|
		10985	Ch 5 - Sample 2047
		10986	Ch 1 - Sample 2048
		10987	Ch 2 - Sample 2048
		10988	Ch 3 - Sample 2048
		10989	Ch 4 - Sample 2048
		10990	Ch 5 - Sample 2048
Aux sync	100	10991 to 11090	

(1) - The data from the five sensor channels of the AVHRR are time multiplexed as indicated. MSB is transmitted first.

References:

P.E.BAYLIS, J.R.MATHER, R.J.BRUSH, A Meteosat Primary Data User Station, University of Dundee, 1980. The book can be requested at ESA, Robert-Bosch-Strasse 5, 6100 Darmstadt, Germany.

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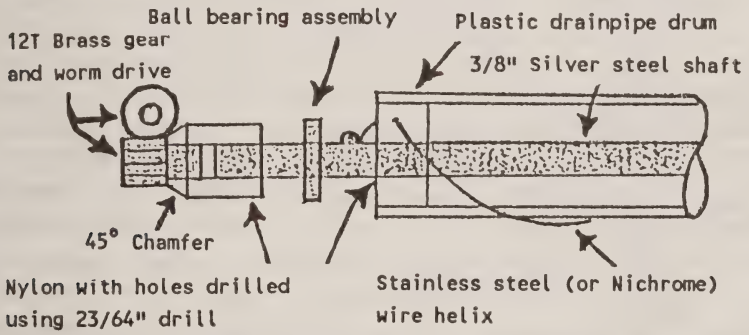
GEARS FOR MECHANICAL FAX MACHINES
By Graham Smith

Anyone who's tried building or modifying a fax machine for satellite pictures, will know what a bind getting hold of suitable gears can be. Gear cutting is time-consuming and unnecessary. You might as well spend a little time and care making adapters on the lathe if you need them. Avoid actually modifying the gears unless you are sure of your skills.

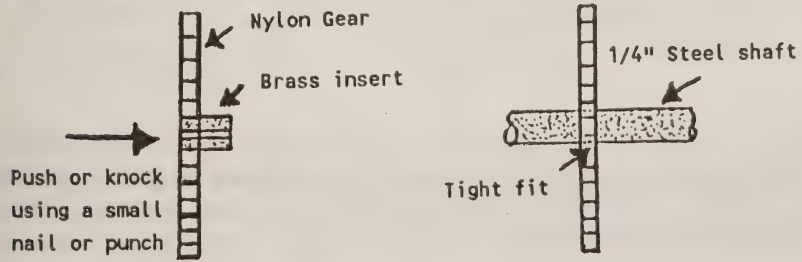
John Tuke GM3BST used Meccano gears in his Short Wave Magazine articles on fax construction in the late 1950s. Photocopies are 85p per section; 1959 Apr, May, June, Oct; 1964 Jan; 1966 Oct; i.e. £5.10 in total. They are obtainable from P.W.Publishing Ltd., FREEPOST, The Quay, Enefco House, Poole, Dorset, BH15 1PP. Phone: 0202 678558.

The gears are from M.W.Models-"Everything Meccano", 4 Greys Road, Henley-on-Thames, Oxfordshire, RG9 1RY. Phone: 0491 572436. A 15 tooth brass pinion and worm drive costs £5.34 inc.P&P. Using a 3600rpm synchronous motor (60Hz supply) gives 240rpm output for Meteosat.



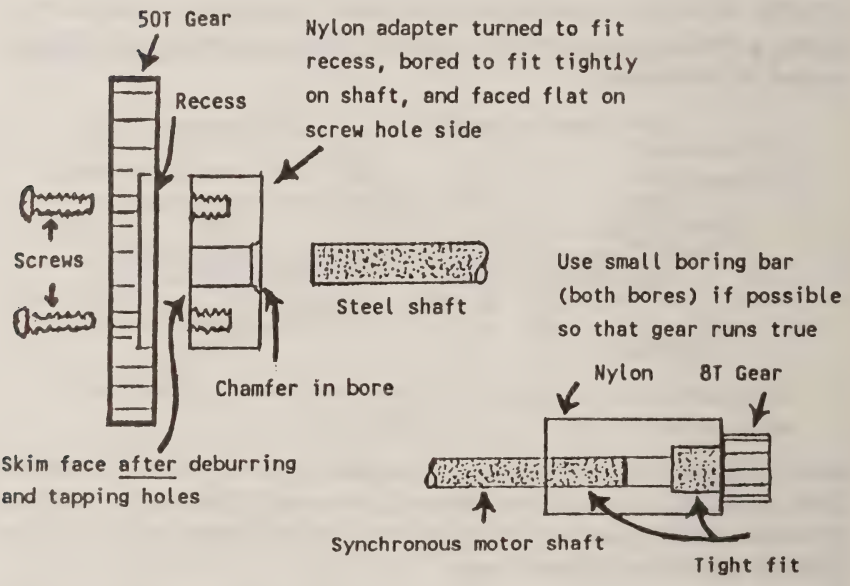
Just a simple coupler is needed, nice and tight on the 3/8" shaft and 3/8" gear body. If you don't know how a helix fax works, Lindsay R.Winkler W6WMI wrote a booklet on it about 20 years ago. Send me a 10"x8" SAE if you'd like a copy.

You can knock the brass insert out of nylon Ripmax gears and fit a 1/4" shaft.



Many model shops deal with "Hobby's" who sell very reasonable priced metric gears in plastic or brass. Worm drives are available, as are toothed belts and pulleys to match. The address is W.Hobby Ltd., Knight's Hill Square, London, SE27 0HH. Phone: 081 761 4244. Their catalogues are £1.70.

Model railway shops stock worm drives and matching gears for locomotives, but these are rather small. Model racing car magazines advertise firms selling plastic or metal gears at only a couple of pounds each and are a good choice for someone building a printer from scratch. For example, use an 8 tooth pinion with a 50 tooth gear (or 16T with 100T). A 1500rpm synchronous motor would give an output of 240rpm. Maplins have some racing car gears in their catalogue.


50T Gear
Nylon adapter turned to fit recess, bored to fit tightly on shaft, and faced flat on screw hole side
Recess
Screws
Steel shaft
Use small boring bar (both bores) if possible so that gear runs true
Nylon
8T Gear
Chamfer in bore
Skim face after deburring and tapping holes
Synchronous motor shaft
Tight fit

Note: If motor shaft has a flat on it, make this adapter a sliding fit on motor shaft and use grub screw through the adapter side, onto the flat, or gear will run out of true.

I'd be interested to hear of any other sources of gears for this application. Graham Smith, G1JVZ, 91 Oakdene Avenue, Chislehurst, Kent, BR7 6DZ.

A LOW COST AERIAL FOR APT RECEPTION
By David Woods

One of the joys of satellite reception has, for me, been that I can build equipment and obtain results that compare well with those from commercial gear. So far I have had success with a homemade decoder and framestore and I decided it was about time to work on a decent aerial. My first reception of NOAA was with a simple telescopic antenna supplied with a scanner, before I moved onto a basic crossed dipole sitting across the rafters of the loft. It was a while before I found that the wiring harness had been connected wrongly (wrong polarisation direction) and a further improvement in reception was achieved when this was fixed. I could receive from the Alps to south of Iceland.

I know little about the theory of aerial design except a few rules of thumb, but knew from reading, that the aerial really ought to be on the roof attached to the chimney to allow a clear view of the entire sky, but I balked at the cost of a 'proper' installation at £40.00 or more. Since these usually consist of a crossed dipole with a reflector mounted below, I felt that it ought to be easy to make one at home.

A crossed dipole with reflector can be thought of as two crossed yagi aerials without director elements and I decided it would be possible to modify existing yagi kits without indulging in too much metalwork. I bought two 2-element FM radio aerials at about £6.00 each, one for each half of the cross, from a local trade supplier. These consisted of an unfolded dipole about 1.5m long mounted on a plastic moulding with screw terminals, and a cap to keep out the elements. This plastic housing fits onto a 1" diameter alloy tube which also holds a reflector whose length is about 5% greater than the dipole. Anyone who has installed domestic aerials will be familiar with this arrangement.

These aerials are designed for 100MHz and therefore for a longer wavelength than 137MHz, and they are ideal for cutting down to size to suit APT transmissions, as they are easy to dismantle and re-assemble. When cutting these elements for use at 137MHz, the dimensions are worked out as follows:

Speed of light	= 300,000,000 metres/second
Frequency of radio signal	= 137,500,000 Hertz
Therefore, wavelength	= 300/137.5 = 2.182 metres
Quarter wavelength	= 0.545 metres

However, in an unshielded conductor, radio signals travel about 5% slower than they would travel through air. Therefore, 1/4 wavelength for 137.5MHz in an open conductor = 0.518 metres and double this value is the 'tip to tip' length of each of the two dipoles in a crossed

dipole. The reflector is made 5% longer than this. The central pole is a 1" diameter, 6ft alloy tube which separates the dipoles from the reflectors by 1 metre [normally 750mm, Ed].
The phasing harness consists of a section of coax a quarter wavelength long. In coaxial cable, the signal travels at 66% of the speed of light and so this piece has a length of 0.545 x 0.66 = 0.36 metres. However because the dipoles were mounted 50mm apart, an extra 50mm x 0.66 was added to keep the phase OK.
The input impedance of my receiver is 75 ohms and I use standard 75 ohm low loss TV cable. A 'matching section' of 50 ohm cable, 0.36m long goes between the aerial and the main length of cable.

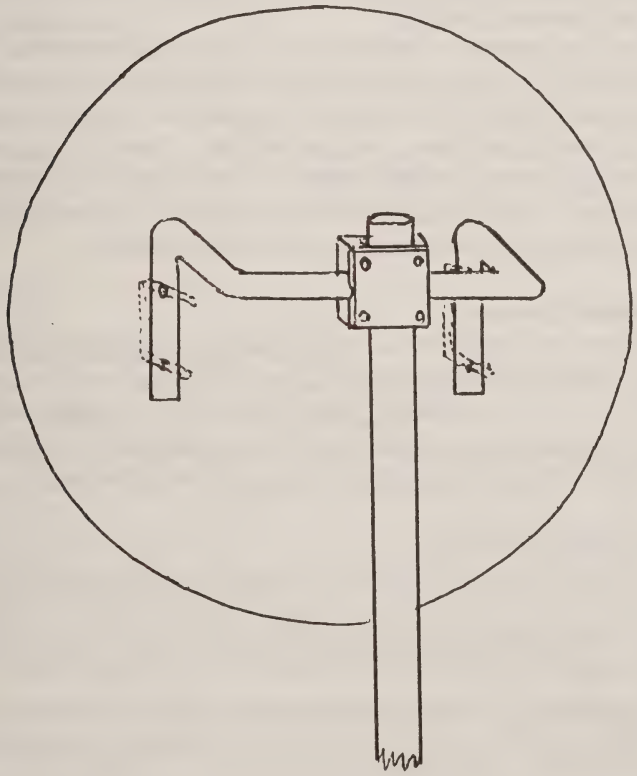
Aerial Construction
The plastic endcaps were removed from the ends of the elements and each was cut to length according to the measurements given above. A hole was drilled right through the centre pole about 50mm from one end to accept the dipole mounting bolt, with another 50mm further down the pole and at right-angles to the first. The cut down dipoles were bolted onto the centre pole at these holes. The reflector rods were also shortened to suit and each was mounted on the centre pole exactly 1 metre [see note above Ed] below its corresponding dipole. After connecting up the cable, taking care over the polarity of the connections, the electrical parts were sealed with epoxy glue and liberal lengths of self-amalgamating tape to try and exclude the Scottish elements. I suppose if the connections were wrong then one could concentrate on Feng Yun 1B reception! (Does anyone suppose that the Chinese wired up their transmitter wrongly? It really is a nuisance having to build another antenna for their satellite.) I lashed the aerial to my chimney where I have a very clear view around the horizon, then I tried it out.
Without recourse to preamps, I get clear coverage from horizon to horizon, and the fadeouts I experience from the north, I attribute to atmospheric conditions near the Earth's pole. Any comments on this? I make a special point of trying to receive pictures from as far afield as possible, e.g. Caspian Sea or Canada, and I even get images from satellites travelling at right angles to lines of longitude, as they travel over and to this side of the North pole.

Many thanks to our member Malcolm Walker, in respect of my request for Pic files from other countries in the last issue, who suggested I contact a teacher in Pennsylvania, U.S.A, who has similar interests. Perhaps we will get some good Noaa pics.
Mike Goodall.

AN ALTERNATIVE DISH TO MAST MOUNTING

By Mike Goodall, G0MGI

A problem faced by most of us when the 1 metre RIG dish arrives (after the comparatively easy construction of the feed, etc.) is how on earth do we mount it to a mast. A trip to the local TV aerial/Satellite installer soon had the problem licked. It appears that Grundig had the same problem and solved it for us by making a handlebar bracket of suitable dimensions. It is made from 1.25" galvanised steel and is 16" wide, just about adequate for a 1 metre dish, and is part of a fixing kit they supply for their Astra Satellite system. Fortunately, these often remain unused, as most dishes are mounted on the wall. It is fixed to the 1 metre dish with flattened 'U'-bolts, and to the mast with a chunky 180 degree mast clamp. This allows easy elevation and traverse. Mine also rests on the roof, so an additional stay may be needed at the top of the dish to the mast, to steady it, a small chain may suffice.



SATELLITE PREDICTION SOFTWARE

Les Hamilton

[Available from Les Hamilton, 8 Deeside Place, Aberdeen AB1 7PW]

As a result of a few recent enquiries from newer RIG members, who spotted the reference to my satellite prediction program for the PC, and who clearly intended to run the software under the Archimedes PC emulator, I thought a short note updating the software I have available would be useful.

Predict

"PREDICT" is a program which reads keplerian elements from a datafile on disc, and uses these to calculate the AOS (Acquisition Of Signal) times for up to six of the day's most favourable passes of a selected satellite. Data is then output as a complete month's printout, listing the equator crossing and AOS time for each pass. Generally, passes within 35 degrees of the UK are included. [See RIG 19 page 46 for sample printout]

Archimedes Version (!Predict)

The original program was written on the Acorn Archimedes, and is very fast indeed. A set of calculations takes only five seconds or so with up-to-date keplers. The current version is mouse driven, and includes an integral keplerian element editor. There is also a switch to toggle output between GMT and BST. A 'Help' file is included in the application. Output can be directed either to screen or printer. This version also, of course, runs on the Acorn A3000.

BBC 'B'/Master Version

The precursor to !Predict was a version for the BBC 'B'/Master computer, which I still have available. This is quite slow, taking a minute or two to calculate a page of data. Also, because of the memory constraints on these machines, keplers are edited and updated by means of a separate program (also on the disc).

PC Version (PC_Predict)

This is a daughter program of the above. Though lacking the speed and finesse of its parent, it nevertheless outputs identical printouts. A page of data takes 20-30 seconds to calculate. It offers most features, except the BST option, but it is not mouse driven, using instead numbered menus. It was developed under the Archimedes PC emulator, and has been tested successfully on a number of different PC compatible microcomputers. A 'Help' file is also provided on the disc.

Satprog

SATPROG is a development of the above, but produces just a single day's printout, including the six or so most favourable passes for ALL satellites on file. As such, it provides a useful schedule for a day's satellite watching (listening ?).

Satprog is at present available only for the Acorn Archimedes microcomputer. Like Predict, it includes an integral kepler editor, and a GMT/BST switch. Indeed, keplerian element datafiles are identical for both applications, and may be freely exchanged between them.

Members wishing any of the above software are welcome to drop me a line along with a suitably formatted disc and accompanied by return packaging and postage. I make no specific charge to RIG members for this software, though small donations [such as cash, PD software or Meteosat animation sequences for the Archimedes] are always welcome to offset the time spent developing the programs.

Such requests are normally dealt with within 48 hours of receipt (holidays permitting).

FOR SALE:

Fully working Thandar Video Printer

Works from composite or separate video signals (PAL 0.5v-10v p-p)
Prints TV pictures on a 5" wide roll of paper
Use with video camera, video recorder, framestore, computer, etc. to get hard copy. Good for teletext, or weather charts with FAX program on Spectrum. Double width facility for graphs
Negative facility for text £150.00 o.n.o. + P&P, or will swap for 256K YU3UMV framestore kit with LOK bits.

Another printer similar to above, needs servicing, £45.00 + P&P

A few synchronous motors suitable for weather fax machines, 1500rpm £7.00 each + P&P

Telephone: 081 857 3106

THE SOVIET AND CHINESE SCENE as at July 5th 1991
Les Currington

Soviet Satellite watchers were awakened from their slumbers on the 24th of April by a new sound. On closer examination of the picture it was apparent that we were seeing a new Meteor Satellite complete with a new format.The unusual sound was coming from the insertion of 1200hzs phasing bars inserted between the reversed grey scale and the binary code. But probably the most interesting observation to Frame store users was that the subcarrier was an exact 2400Hz and was now locked to the 12 phasing bars making viewing much easier. Needless to say this new addition to the scene was first observed by our keen pundit James Brown - in fact he had heard it before it was announced by the Soviets. On the the 6th of June, after a tip off from Geoff Perry we were rewarded with the first pictures of a new Okean 3. At 8.58gmt an excellent visible pass was recorded from Italy to Norway; followed by Radar on the 8th June. On the 10th of June a recorded picture was seen covering the area to the north of Japan. Recordings of test transmissions covering a two week period have been made enabling some interesting prints to be made at a later date.

Gordon Train of Keswick sent me recordings of severe interference he has been receiving around 137.5Mhz recently of a continuous pulsed tone and I'm sure he would be interested to get reports of any similar interference in the area.I have mentioned the above interference as the Soviet Intercosmos 24 Activny Satellite has been heard recently giving a strong signal around the London area.See the last RIG for the type of interference as shown on a frame store. Just as this report was being sent to the RIG editor a most interesting tape of Okean recordings was received from Dr Bjortorp of Norway; a most welcome surprise.

OKEAN 3 1991-39A 137.4Mhz
The new Oceanographic Radar Satellite at the time of writing is still testing and getting the amplitude and contrast levels adjusted. Some outstanding Radar pictures have been seen, and I for one will be watching this Satellite with even greater interest than usual. It is worth pointing out for new RIG members that transmissions only occur on about two orbits per day to UK viewers and then only when in range of the test area.

METEOR 3-4 1991-30A 137.3Mhz
Some interesting passes can be seen in the early morning and late evening of the polar region, and with extra magnification

large icebergs can be observed. At the time of writing the near overhead descending pass is around 08.00hrs and the evening ascending at 19.00hrs. During the late evening, transmissions commence with IR and then change to a visible picture when approaching the polar regions. If you are running PCSat3 you will need a update from Henry before you are able to run Meteor 3-4. Also in order to receive the IR you will have to switch to VGAMETR. Why not try pressing the visible switch on the Frame Store LOK board-my picture then lines up perfectly.

METEOR 2-20 1990-86A 137.85Mhz

At the time of printing RIG 24 brief mention was made of Meteor 2-20 losing all sync bars and grey scale; this condition prevailed until transmissions ceased. When transmissions resumed the fault was still showing, but during the last few days all images are of good quality and working normally.

FENG YUN 1-b 1990-81 137.8Mhz

A report from Dave Cawley of Timestep on the beginning of June stated that he was now receiving HRPR transmission on the morning pass. It does look as though Feng Yun has now been stabilised and could be resuming normal transmissions.This is grand news so maybe we shall soon see transmissions on VHF.

To summarise Meteor 3-4 is sending good pictures. Meteor 2-20 is working normally, Meteor 3-3 and 2-19 are silent.

MEMBER'S LETTERS

Dear Editor,

Many thanks for replying to my enquiry regarding rig membership so promptly. I found the copy of RIG 24 extremely interesting to say the least, in fact I was very impressed. I intend to join RIG within the next couple of weeks, and build myself a weather satellite receiving station as soon as possible. As you suggested, I have been to see a working YU3UMV frame store in action at Eddie Wilkinson's QTH, and took a quick look inside it, so I know what I am letting myself in for! Many thanks for your time once again,

Pete Walsh, Manchester.

KEPLER ELEMENTS
Provided by Max White - Kettering Group

	NOAA 9	NOAA 10	NOAA 11
	137.62 MHz	137.50 MHz	137.62 MHz
	84-123	86-73	88-89
EPOCH OF DATA	91185.20239564	91182.52803727	91185.84935652
ACCELERATION	0.00000218	0.00000487	0.00000526
REV NO.	33792	24859	14296
INCLINATION	99.1665	98.5623	99.0312
R. A. NODE	199.1288	206.3708	140.7594
ECCENTRICITY	0.0015366	0.0012221	0.0011189
ARG OF PERIGEE	21.0564	244.1871	289.7520
MEAN ANOMALY	339.1226	115.8043	70.2477
MEAN MOTION	14.13047664	14.24182908	14.12196958

	NOAA 12	MET 2-16	MET 2-17
	137.50 MHz	137.85 MHz	137.30 MHz
	91-32	87-68	88-05
EPOCH OF DATA	91179.54644908	91185.84511092	91185.66748883
ACCELERATION	0.00000726	0.00000123	0.00000180
REV NO.	637	19590	17310
INCLINATION	98.7334	82.5533	82.5422
R. A. NODE	208.7650	346.9758	46.3909
ECCENTRICITY	0.0014169	0.0010837	0.0016913
ARG OF PERIGEE	132.3462	262.1658	336.5346
MEAN ANOMALY	277.8918	97.8274	23.5038
MEAN MOTION	14.21447315	13.83806876	13.84505102

	MET 2-18	MET 2-19	MET 2-20
	137.30 MHz	137.85 MHz	137.30 MHz
	89-18	90-57	90-86
EPOCH OF DATA	91185.73896893	91181.50005510	91181.74169012
ACCELERATION	0.00000188	0.00000137	0.00000182
REV NO.	11848	5084	3808
INCLINATION	82.5187	82.5445	82.5236
R. A. NODE	283.6245	348.3402	287.1035
ECCENTRICITY	0.0015540	0.0015570	0.0012406
ARG OF PERIGEE	16.4955	311.6252	197.8663
MEAN ANOMALY	343.6713	48.3569	162.2062
MEAN MOTION	13.84148649	13.83983648	13.83357813

	OKEAN 2	OKEAN 3	MET 3-2
	137.40 MHz	137.40 MHz	137.30 MHz
	90-18		88-64
EPOCH OF DATA	91181.78294703	91183.57637200	91185.87862865
ACCELERATION	0.00002264	0.00001308	0.00000019
REV NO.	7184	416	14132
INCLINATION	82.5292	82.5273	82.5402
R. A. NODE	108.6131	15.5980	6.6708
ECCENTRICITY	0.0021043	0.0023311	0.0018478
ARG OF PERIGEE	120.9117	174.6775	77.2136
MEAN ANOMALY	239.4174	185.4686	283.1046
MEAN MOTION	14.75084736	14.73695254	13.16926285

	MET 3-3	MET 3-4	FENG YUN 1B
	137.85 MHz	137.30 MHz	137.80 MHz
	89-86	91-30	90-81
EPOCH OF DATA	91185.81807627	91181.56686270	91175.57544136
ACCELERATION	0.00000043	0.00000005	0.00000046
REV NO.	8127	888	4124
INCLINATION	82.5515	82.5449	98.9474
R. A. NODE	308.1143	215.0618	208.9748
ECCENTRICITY	0.0017377	0.0017907	0.0014229
ARG OF PERIGEE	91.8241	24.8237	151.5320
MEAN ANOMALY	268.4870	335.3744	208.6625
MEAN MOTION	13.15956390	13.15983567	14.01164006

FRAME-STORE UPDATE...

Adapt your frame-store to display NOAA HRPT and Meteosat Primary images. All items available: receivers, frame synchroniser etc., to receive high quality digital images.

Send SAE for full details to:
Peter Hayes, Seahaze Kennels, Spring Garden Farm, Dunure Rd., Ayr KA7 4LA, Strathclyde.

SOVIET & CHINESE REFERENCE ORBITS

Simon Goodall

These are the times of north bound equator crossings (in GMT) and longitudes (in degrees west) for three Russian satellites and Feng Yun 1B. They are given at weekly intervals together with the period and the change in longitude per orbit.

MET 2-20

period 104.18 minutes increment 26.2 degrees

1 SEP 16:00 346	8 SEP 16:23 2	15 SEP 15:01 354	22 SEP 13:40 346
29 SEP 14:02 4	6 OCT 12:41 356	13 OCT 11:19 348	20 OCT 11:42 6
27 OCT 10:20 358	3 NOV 08:58 350	10 NOV 07:37 342	17 NOV 08:00 0

OKEAN 3

period 96.72 minutes increment 24.6 degrees

1 SEP 00:03 21	8 SEP 22:41 15	15 SEP 20:53 2	22 SEP 20:42 12
29 SEP 18:54 358	6 OCT 18:42 9	13 OCT 18:31 19	20 OCT 16:42 6
27 OCT 16:31 16	3 NOV 14:42 2	10 NOV 14:30 12	17 NOV 12:41 358

MET 3-4

period 109.48 minutes increment 27.5 degrees

1 SEP 12:26 356	8 SEP 10:29 339	15 SEP 10:22 349	22 SEP 10:14 359
29 SEP 08:17 341	6 OCT 08:09 351	13 OCT 08:01 1	20 OCT 06:04 343
27 OCT 05:56 353	3 NOV 05:49 3	10 NOV 03:51 346	17 NOV 03:44 355

FENG YUN 1B

period 102.77 minutes increment 25.7 degrees

1 SEP 20:11 6	8 SEP 20:08 6	15 SEP 20:05 5	22 SEP 20:02 4
29 SEP 19:59 3	6 OCT 19:57 3	13 OCT 19:54 2	20 OCT 21:34 27
27 OCT 21:31 26	3 NOV 21:28 26	10 NOV 21:25 25	17 NOV 21:22 24

LNA DEVELOPMENTS & KIT PARTS

Only for those that are competent to undertake this project.
Chairman

Many of you have asked us for the LNA kits. The first batch were quickly sold out and we were just going to reissue exactly the same as before. Things are never as simple as that and this was no exception. Ian Gurton had done a good job on the first batch and noise figures below 1db were readily obtainable. This kit was quite expensive, so much so, the group hardly made any profit on them. There were several modifications brought out to improve the performance or to stabilise the unit from oscillation. The kit also contained some expensive components which Henry thought was extravagant and unnecessary. He doesn't like paying £2 for a 5.6pf capacitor for instance!

In a recent edition of VHF Communications there was an article about GASFET's in general and it included several rather bold statements. The main one was that whatever adjustments you do to the drain onwards will have very little, if any, effect on the overall noise performance as long as the unit is relatively stable. Those expensive 5.6pf capacitors were between the first device's output and the input circuit of the 2nd GASFET and would have very little effect on the noise figure! The other expensive capacitor was in the source lead of the GASFETs and could be construed as being part of the input circuit and therefore need to be of superlative quality. If that was so, why is there a 220 ohm, or less, resistor across it? It certainly is not going to increase the Q of the capacitor! On reading the original article it was learnt that the source lead is not cut or modified at all so that a small amount of inductance is left in circuit to act as negative feedback. A small amount of internal inductance in the bypass capacitor will not have a great deal of effect as long as it isn't taken to extremes.

Surface Mount Components have a great deal to offer us in these circumstances. They are rather small, the capacitors have very low inductance and the resistors are made of a resistive ink on a ceramic substrate. Another problem was that the original PCB was expensive even though it was of small size. What can Henry do about all this. Usually the answer is not a lot, but this time Henry's grey cells were gradually working their way around all these problems.
The PCB, why use an etched board? Why not use the copper as a ground plane, the C's as standoff insulators and mount everything above it, like circuits were produced in the old days? This results in no special PCB requirement as there are no RF connections on it.

Any quality will do! There was one special type of component required and that was the 50 ohm resistors with a bit of inductance in series, to damp the drain circuits down and stop them oscillating. This resistor needs to be of a composite carbon type of construction because the etched metal film construction type has too much inductance and cannot be used. The SM type of resistors are quite acceptable. Another problem is with the first device itself. Originally it was a 72084 but was later replaced by a 32084 HEMT. This has now been replaced with a 32184A HEMT (marked on the ceramic case with the letter "G") and are available from NEC in the UK for about £27 each + processing fees. These devices work in a different way and are capable of even lower noise figures. The actual path the electrons move along is only a few atoms thick and they travel through without bouncing off many. They travel in a sort of microscopic channel instead of bouncing around like a pinball machine. This means that they generate less internal noise than previous devices.

Using the 72084 GASFET resulted in noise figures of around 0.7db. A 32084 reduced this to below 0.6db and with careful optimisation this could be bettered. The main thing after the circuit has been assembled is the biasing of the first two devices. This results in quite a considerable improvement in performance over a non optimised unit. However this is where Henry usually has a casualty on his hands! Before any work is done on these extremely sensitive devices make sure that after the supply is turned off and before any DC conditions are changed a shorting wire link is soldered from earth to the electrode that you wish to adjust. A source connection left OC can give to many volts either AC or DC when the soldering iron is applied, even the capacity of the heating element to the bit gives too many! Stringent earthing precautions must always be observed!

I've tried several methods of describing the circuit but I feel the following is the best so far. It is an electrons journey through the device and deals with everything in the signal path. Imagine you are an electron just emerging from the UT141. To ensure that the average DC level is at ground potential there is a RFC L1 (8 turns 28AWG) to earth. Thats not going to let you move far from 0 volts DC and it will only look like high impedance at many tens of Mhz. As you emerge from the UT141 you are at 50 ohms impedance and for optimisation you need to get into top gear (high impedance) by a miniature quarter wave inductor that will transform your 50 ohms up to a very high level. This quarter wave inductor is L2 (3 turns 28AWG). L2 and the input capacitance of the HEMT is a series resonant circuit (not quite on resonance because better overall

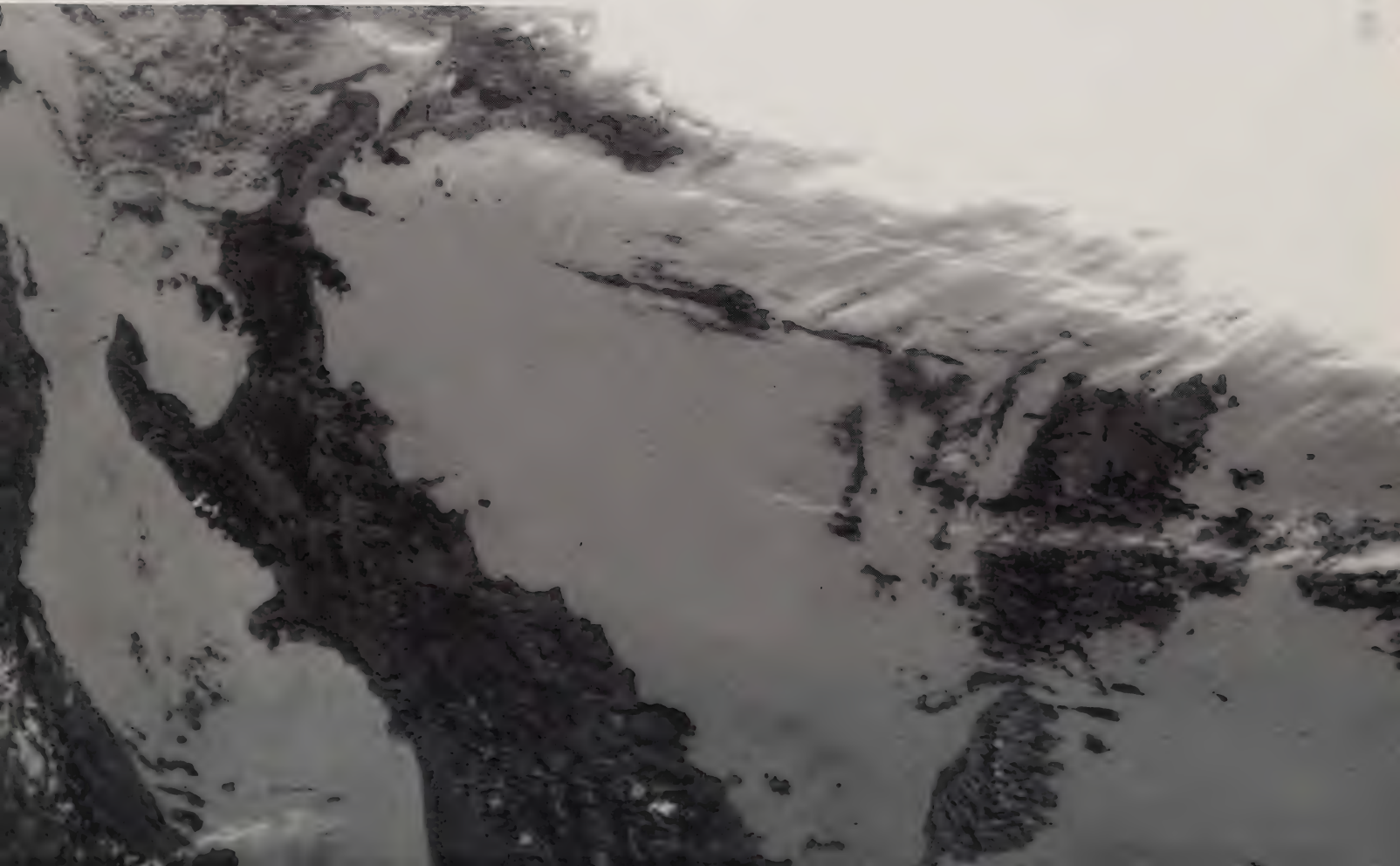
performance is obtained when slightly off tune). Just before you enter this first active device you can see the source bypass capacitors 3.5mm on either side of it . One of these has a 220 ohm chip resistor in parallel with it. I don't know which part of the gate structure you are going to finish up in but you jump up about 3 volts DC and change gear by 16db gain and continue. As you leave the drain the current and volts are being fed into the device from L3 (3 turns of 28AWG), and R5 50 ohms. R5 may be a chip resistor or a carbon composite type. To remove the DC level and prepare you for the next stage a 5.6pf capacitor is in series with the signal line and just in case you had any thoughts of oscillating or doing any weird things another 50 ohm resistor R6 (chip resistor) will damp you down! The other end of R6 has a 1.5pf (capacity of the pad to the ground plane on the original board) to earth and L4 (2 turns 28AWG) to earth. To change your impedance to match that of the GASFET you have to go through L5 (3 turns 28AWG). Again just as you go into the second device you see the two source bypass capacitors 3.5mm on either side, one of which also has a 220 ohm R3 in parallel with it. After another 3volt jump and 16db increase in gain, you emerge to find R7 50 ohm chip resistor decoupled at the far end with a 100pf chip capacitor supplying all the urge. In front of you is a 5.6pf decoupling capacitor and the input to yet another device. This time it is a MAR6 and its two legs go down to earth. Urge is supplied from a 510 ohm chip resistor and you get another 12db gain. All that is required is to remove the DC level and feed you back into the UT141 cable at 50 ohm impedance and on your way to the next operation. Don't add up all the gain figures and say what has happened to it all? There are circuit losses to contend with. The RF signal stays about 3mm above the board all the way through the amplifier and never actually goes onto the PCB. 12volts DC is fed to the MAR6 and the 78L05 regulator and thence to the first two devices with decoupling in appropriate positions.

The actual circuit is reproduced nearby. The signal is delivered into the circuit by a short length of UT141. This can either be soldered directly along and onto the ground plane or after a tight fitting hole has been drilled, through the PCB and soldered neatly on both sides. You need a hot iron for this because it absorbs a lot of heat initially. The end has to be prepared prior to this and because you are dealing in micro electronics now, only 2mm of the screening foil should be removed and 1mm of the PTFE insulation removed. This leaves just enough conductor to connect L1 and L2 to. L1 and L2 are very small diameter and care needs to be observed to ensure that the turns are spaced slightly. I have tried solid silver wire for these but the turns short out very easily and I am told that at these

frequencies there would be little advantage. Using enamel insulated wire will help to prevent this but remember that very short connecting leads are required.

All the RF circuits lie in a straight line with the bypass and decoupling capacitors on either side as required. The two source bypass capacitors for both stages are spaced 7mm apart and equidistant from the RF signal line, ie. 3.5mm each side of it. These are the 100pf chips that are unmarked but I have included a spare in the kits just in case! They are difficult to handle but I find that if a short length of solder attached to one end (quickly) it is much easier to handle and position them correctly. Connect R1 220 ohm source resistor to the copper ground plane adjacent (touching on the outside) to C1 or C2, and let the solder flow across the top to connect with the 100 pf. You now have to handle and connect the HEMT. I have found the following notes help. First the electrode layout. The gate is the connection with the diagonal cut, the two source connections are on either side and the drain connection is directly opposite the gate. They are extremely small. I have found that if the device is shorted out by the following technique you can handle them with a great deal more confidence and a lot less worry. Obtain a 4" length of very fine tinned copper wire (about 40SWG). Open the GASFET / HEMT package and just observe! DO NOT TOUCH! The pointed one is the gate - don't touch it with anything! Take precautions to rid yourself of any static voltages by touching things like C H radiators or taps etc. It might be wise to connect a wire between earth and yourself via a 1meg ohm resistor. Be careful that these are exactly as they should be because it will not be the first time that a wrong connection has been made inadvertently! Touch any foam or loaded plastic packaging material first to equalise any residual voltages. With a fine pair of tweezers pick up the device by either of the source leads. These are the leads on either side of the pointed (gate) lead. Whilst still holding it wrap a turn of the fine tinned copper wire around the tweezers and then around the source lead that you are holding it by. Make certain that this second turn is as close to the device as possible. Next place another turn around the drain lead (opposite the gate). Then place a turn around the second source lead.

Finally place a turn around the gate lead and then have a cup of tea to calm your nerves! These turns around the individual leads need to be as close to the device body as possible. With all four leads shorted out you can relax because nothing untoward should happen to it now. This wire remains on it until volts are about to be applied. Also while soldering the device into circuit do not let the solder go near this wire otherwise it will be very difficult to remove!



NOAA '9' PERIOD 101.961805 MINS INCR 25.48812 DEG

1/08 347 17:42	31/08 354 18:14	30/09 335 17:03	31/10 339 17:23
2/08 343 17:29	1/09 350 18:01	1/10 332 16:51	1/11 183 06:58
3/08 187 07:05	2/09 347 17:48	2/10 354 18:20	1/11 336 17:10
3/08 340 17:17	3/09 344 17:36	3/10 351 18:08	2/11 333 16:58
4/08 184 06:52	4/09 188 07:12	4/10 348 17:55	3/11 355 18:27
4/08 337 17:04	4/09 341 17:23	5/10 345 17:43	4/11 352 18:14
5/08 181 06:40	5/09 185 06:59	6/10 189 07:18	5/11 349 18:02
5/08 334 16:52	5/09 338 17:11	6/10 342 17:30	6/11 345 17:49
6/08 331 16:39	6/09 182 06:47	7/10 185 07:06	7/11 189 07:25
7/08 353 18:08	6/09 335 16:58	7/10 338 17:18	7/11 342 17:37
8/08 350 17:56	7/09 331 16:46	8/10 182 06:53	8/11 186 07:13
9/08 347 17:43	8/09 354 18:15	8/10 335 17:05	8/11 339 17:24
10/08 344 17:31	9/09 351 18:03	9/10 332 16:53	9/11 183 07:00
11/08 188 07:07	10/09 347 17:50	10/10 354 18:22	9/11 336 17:12
11/08 340 17:18	11/09 344 17:38	11/10 351 18:09	10/11 333 16:59
12/08 184 06:54	12/09 188 07:13	12/10 348 17:57	11/11 330 16:47
12/08 337 17:06	12/09 341 17:25	13/10 345 17:44	11/11 355 18:29
13/08 181 06:42	13/09 185 07:01	14/10 189 07:20	12/11 352 18:16
13/08 334 16:53	13/09 338 17:13	14/10 342 17:32	13/11 349 18:04
14/08 331 16:41	14/09 182 06:48	15/10 186 07:08	14/11 346 17:51
15/08 353 18:10	14/09 335 17:00	15/10 339 17:19	15/11 189 07:27
16/08 350 17:58	15/09 332 16:47	16/10 182 06:55	15/11 342 17:39
17/08 347 17:45	16/09 354 18:17	16/10 335 17:07	16/11 186 07:14
18/08 344 17:33	17/09 351 18:04	17/10 332 16:54	16/11 339 17:26
19/08 188 07:08	18/09 348 17:52	18/10 355 18:24	17/11 183 07:02
19/08 341 17:20	19/09 344 17:39	19/10 351 18:11	17/11 336 17:13
20/08 185 06:56	20/09 188 07:15	20/10 348 17:59	18/11 333 17:01
20/08 337 17:08	20/09 341 17:27	21/10 345 17:46	19/11 330 16:48
21/08 181 06:43	21/09 185 07:02	22/10 189 07:22	19/11 355 18:30
21/08 334 16:55	21/09 338 17:14	22/10 342 17:34	20/11 352 18:18
22/08 331 16:42	22/09 182 06:50	23/10 186 07:09	21/11 349 18:05
23/08 353 18:12	22/09 335 17:02	23/10 339 17:21	22/11 346 17:53
24/08 350 17:59	23/09 332 16:49	24/10 183 06:57	23/11 190 07:28
25/08 347 17:47	24/09 354 18:19	24/10 336 17:08	23/11 343 17:40
26/08 344 17:34	25/09 351 18:06	25/10 332 16:56	24/11 186 07:16
27/08 188 07:10	26/09 348 17:54	26/10 355 18:25	24/11 339 17:28
27/08 341 17:22	27/09 345 17:41	27/10 352 18:13	25/11 183 07:03
28/08 185 06:57	28/09 188 07:17	28/10 348 18:00	25/11 336 17:15
28/08 338 17:09	28/09 341 17:28	29/10 345 17:48	26/11 333 17:03
29/08 182 06:45	29/09 185 07:04	30/10 189 07:23	27/11 330 16:50
29/08 334 16:57	29/09 338 17:16	30/10 342 17:35	27/11 355 18:32
30/08 331 16:44	30/09 182 06:52	31/10 186 07:11	28/11 352 18:20

All morning passes are southbound, evening passes are northbound.
Frequency 137.62MHz. INCRement is degrees change per orbit.

NOAA '10' PERIOD 101.16611129 MINS INCR 25.2927 DEG

1/08 332 17:18	31/08 332 17:16	30/09 332 17:14	30/10 332 17:12
2/08 352 18:35	1/09 352 18:33	1/10 352 18:31	31/10 352 18:29
3/08 346 18:12	2/09 346 18:10	2/10 346 18:08	1/11 346 18:06
4/08 188 07:41	3/09 188 07:39	3/10 188 07:37	2/11 188 07:35
4/08 340 17:48	3/09 340 17:46	3/10 340 17:44	2/11 340 17:42
5/08 182 07:17	4/09 182 07:15	4/10 182 07:13	3/11 182 07:11
5/08 334 17:24	4/09 334 17:22	4/10 334 17:20	3/11 334 17:18
6/08 353 18:42	5/09 353 18:40	5/10 353 18:38	4/11 353 18:36
7/08 347 18:18	6/09 347 18:16	6/10 347 18:14	5/11 347 18:12
8/08 190 07:48	7/09 190 07:45	7/10 190 07:43	6/11 190 07:41
8/08 342 17:55	7/09 342 17:52	7/10 342 17:50	6/11 342 17:48
9/08 184 07:24	8/09 184 07:22	8/10 184 07:20	7/11 184 07:18
9/08 336 17:31	8/09 336 17:29	8/10 336 17:27	7/11 336 17:25
10/08 330 17:07	9/09 330 17:05	9/10 330 17:03	8/11 330 17:01
10/08 355 18:48	9/09 355 18:46	9/10 355 18:44	8/11 355 18:42
11/08 349 18:25	10/09 349 18:23	10/10 349 18:21	9/11 349 18:18
12/08 343 18:01	11/09 343 17:59	11/10 343 17:57	10/11 343 17:55
13/08 186 07:30	12/09 186 07:28	12/10 186 07:26	11/11 186 07:24
13/08 337 17:37	12/09 337 17:35	12/10 337 17:33	11/11 337 17:31
14/08 331 17:14	13/09 331 17:12	13/10 331 17:10	12/11 331 17:07
15/08 351 18:31	14/09 351 18:29	14/10 351 18:27	13/11 351 18:25
16/08 345 18:07	15/09 345 18:05	15/10 345 18:03	14/11 345 18:01
17/08 187 07:37	16/09 187 07:35	16/10 187 07:33	15/11 187 07:31
17/08 339 17:44	16/09 339 17:42	16/10 339 17:40	15/11 339 17:38
18/08 181 07:13	17/09 181 07:11	17/10 181 07:09	16/11 181 07:07
18/08 333 17:20	17/09 333 17:18	17/10 333 17:16	16/11 333 17:14
19/08 352 18:38	18/09 352 18:36	18/10 352 18:33	17/11 352 18:31
20/08 347 18:14	19/09 347 18:12	19/10 347 18:10	18/11 347 18:08
21/08 189 07:43	20/09 189 07:41	20/10 189 07:39	19/11 189 07:37
21/08 341 17:50	20/09 341 17:48	20/10 341 17:46	19/11 341 17:44
22/08 183 07:20	21/09 183 07:18	21/10 183 07:15	20/11 183 07:13
22/08 335 17:27	21/09 335 17:25	21/10 335 17:22	20/11 335 17:20
23/08 354 18:44	22/09 354 18:42	22/10 354 18:40	21/11 354 18:38
24/08 348 18:20	23/09 348 18:18	23/10 348 18:16	22/11 348 18:14
25/08 342 17:57	24/09 342 17:55	24/10 342 17:53	23/11 342 17:51
26/08 185 07:26	25/09 185 07:24	25/10 185 07:22	24/11 185 07:20
26/08 336 17:33	25/09 336 17:31	25/10 336 17:29	24/11 336 17:27
27/08 331 17:09	26/09 331 17:07	26/10 331 17:05	25/11 331 17:03
28/08 350 18:27	27/09 350 18:25	27/10 350 18:23	26/11 350 18:21
29/08 344 18:03	28/09 344 18:01	28/10 344 17:59	27/11 344 17:57
30/08 186 07:33	29/09 186 07:30	29/10 186 07:28	28/11 186 07:26
30/08 338 17:40	29/09 338 17:37	29/10 338 17:35	28/11 338 17:33

All morning passes are southbound, evening passes are northbound.
Frequency 137.50MHz. INCRement is degrees change per orbit.

LATE NEWS

WANTED

Meteosat or Polar images of the UK (especially IR) recorded on the following occasions:

11 Feb 90	from 12-00	to 15-00GMT	30 Jul 90	from 00-00	to 20-00GMT
3 Jun 90	08-00	13-00	29 Sep 90	17-00	23-00
6 Jun 90	08-00	13-00	6 Oct 90	10-00	18-30
20 Jun 90	10-00	16-00	25 Dec 90	05-00	12-00

IR Images are of primary interest but WV or visible could be of use in a "Radio Propagation on Earth-Space Links". Copies of data / tape (cassette),(media supplied) would be greatly appreciated.
Contact:- Patrick Hartigan, Coventry Polytechnic, EES Dept,
Priory Str. Coventry, CV1 5FB Tel. 0203838715 W / 0926813244 H

LNA Kit Latest

Further slight modifications have been incorporated into the kit and this results slightly lower noise figure performance. These and any other modifications will be included in the kit. A final price has now been fixed for this kit of £28 including P & P (UK only, enquire for other destinations). I am dealing with this kit and everything should be addressed to me (chairman).

Meteor 3-5 Launched.

Keplers 21655 91-56A 232.69012549 .00000043 82.5564 125.2164 0.0012313 257.1593 102.8242 13.16774642 Rev 70

Equipment surplus to requirements

Swap for Weather satellite equipment or Computer units.
Tektronix 7623A 4 beam Storage Oscilloscope with FET probes.
Gould Advance Oscilloscope OS3000. Farnell AF Oscillator.
Hewlett Packard Logic Probe and Pulser. Weller Desoldering Station.
Racal multimeter 4003. Racal frequency counter 9906.
Contact 088432388 -- Devon.

Printer problems

We have encountered problems with our previous printer, mainly caused by other work having to be done first. After 6 weeks it was taken away from them and placed with Abbey Printers at Spalding. I am extremely grateful to them for their help when we had a problem.

Reply times from the Chairman

At present I am extremely busy and can only deal with simple things quickly. I should slow down by the middle to end of October and then clear up the correspondence pile! This also applies to the LNA kits.

METEOSAT 3 ATLANTIC DISSEMINATION SCHEDULE
CHANNEL A1 - 1691 MHz

GMT HH MM	00	03	06	09	12	15	18	21
2	TIW 48	TIW 06	TIW 12	TIW 18	TIVH24	TIVH30	TIVH36	TIVH42
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
14	L1D 47	L1D 05	L1D 11	L1D 17	L1D 23	L1D 29	L1D 35	L1D 41
18	L2D 47	L2D 05	L2D 11	L2D 17	L1C 23	L1C 29	L1C 35	L1C 41
22	L3D 47	L3D 05	L3D 11	L3D 17	TW 24	TW 30	TW 36	TW 42
26	L4D 47	L4D 05	L4D 11	L4D 17	TW 24	.. ..	.. ..	.. ..
30	TIW 01	TIW 07	TIW 13	TIW 19	SIVW25	SIVW31	SIVW37	SIVW43
34	.. ..	.. ..	.. ..	.. ..	TIW 25	TIW 31	TIW 37	TIW 43
38	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
42	L5D 47	L5D 05	L5D 11	L5D 17	.. ..	.. ..	.. ..	.. ..
46	L6E 47	L6D 05	L6D 11	L6D 17	L3D 23	L3D 29	L3D 35	L3D 41
50	L1E 47	L1E 05	L1E 11	L1E 17	L4D 23	L4D 29	L4D 35	L4D 41
54	L3E 47	L3E 05	L3E 11	L3E 17	L5D 23	L5D 29	L5D 35	L5D 41
58	L5E 47	L5E 05	L5E 11	L5E 17	L6D 23	TIVH32	L6D 35	TIVH44

GMT HH MM	01	04	07	10	13	16	19	22
2	TIW 02	TIW 08	TIW 14	TIW 20	TIVH26	.. ..	TIVH38	.. ..
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10	.. ..	.. ..	.. ..	.. ..	.. ..	TW 32	.. ..	TW 44
14	X	X	X	X	X	.. ..	X	.. ..
18	X R	X R	X R	X R	X R	X R	X R	X R
22	X R	X R	X R	X R	X R	X R	X R	X R
26	o R	o R	X R	X R	X R	X R	X R	X R
30	SIVW03	TIW 09	SIVW15	TIW 21	SIVW27	SIVW33	SIVW39	SIVW45
34	L1D 01	.. ..	o	.. ..	o	TIW 33	o	TIW 45
38	L2D 01	.. ..	L1D 13	.. ..		.. ..		.. ..
42	L3D 01	L1D 07	L2D 13	L1D 19	L1D 25	.. ..	L1D 37	.. ..
46	L4D 01	L3D 07	L3D 13	L3D 19	L3D 25	L1D 31	L3D 37	L1D 43
50	L5D 01	L4D 07	L4D 13	L4D 19	L4D 25	L3D 31	L4D 37	L3D 43
54	L6D 01	L5D 07	L5D 13	L5D 19	L5D 25	L4D 31	L5D 37	L4D 43
58	L1E 01	L6D 07	L6D 13	L6D 19	L6D 25	L5D 31	L6D 37	L5D 43

GMT HH MM	02	05	08	11	14	17	20	23
2	TIW 04	TIW 10	TIW 16	TIVH22	TIVH28	TIVH34	TIVH40	TIVH46
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
14	L1D 03	L1D 09	L1D 15	L1D 21	L1D 27	L1D 33	L1D 39	L1D 45
18	L2D 03	L2D 09	L2D 15	L1C 21	L1C 27	L1C 33	L1C 39	L1C 45
22	L3D 03	L3D 09	L3D 15	TW 22	L2C 27	TW 34	L2C 39	TW 46
26	L4D 03	L4D 09	L4D 15	.. ..	L3C 27	.. ..	L3C 39	.. ..
30	SIVW05	TIW 11	SIVW17	SIVW23	SIVW29	SIVW35	SIVW41	SIVW47
34	L5D 03	.. ..	L5D 15	TIW 23	L4C 27	TIW 35	L4C 39	TIW 47
38	L6D 03	.. ..	L6D 15	.. ..	L5C 27	.. ..	L5C 39	.. ..
42	ADMIN	L5D 09	ADMIN	.. ..	L6C 27	.. ..	L6C 39	.. ..
46	A TEST	L6D 09	A TEST	L3D 21	L3D 27	L3D 33	L3D 39	L3C 45
50		L1E 09		L4D 21	L4D 27	L4D 33	L4D 39	L4C 45
54	A TEST	L3E 09	A TEST	L5D 21	L5D 27	L5D 33	L5D 39	L5C 45
58	A TEST	L5D 09	A TEST	L6D 21	L6D 27	L6D 33	L6D 39	L6C 45

Meteosat 3 is now at 50°W. From the UK aim 236° & 15°elevation. Start with horizontal polarisation and then rotate for optimum.

This is a compilation of the LAN and ESOC transmissions.

METEOSAT 4 DISSEMINATION SCHEDULE:
CHANNEL A2 - 1694.5 MHz

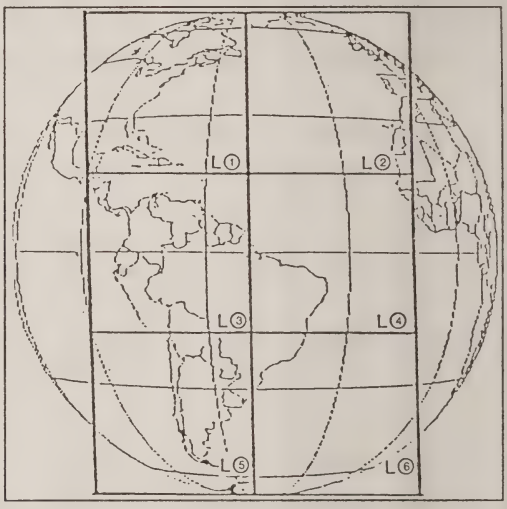
GMT MM	HH 00	03	06	09	12	15	18	21
2	AI 48	AI 6	AIVH12	AIVH18	AIVH24	AIVH30	AI 36	AI 42
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10			.. ..	.. ..	.. ..	.. ..		
14	DTOT48	DTOT 6	DTOT12	DTOT18	DTOT24	DTOT30	DTOT36	DTOT42
18	ETOT48	ETOT 6	ETOT12	CTOT18	CTOT24	CTOT30	ETOT36	ETOT42
22			WEFAX2	ATEST0				ATEST0
26			.. ..	.. ..				.. ..
30	BIW 1	BIW 7	BIV 13	BIV 19	BIV 25	BIV 31	BIV 37	BIW 43
34	AI 1	AI 7	AIVH13	AIVH19	AIVH25	AIVH31	AI 37	AI 43
38	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
42	LY 1	LY 7	.. ..	.. ..	.. ..	.. ..	AW 37	AW 43
46	LR 1	LR 7	LY 13	LY 19	AW 25	AW 31	.. ..	.. ..
50			LR 13	LR 19	.. ..	.. ..	WEFAX5	
54							.. ..	
58	BIW 2	BIW 8	BIVW14	BIVW20	BIVW26	BIVW32	BIVW38	BIW 44

GMT MM	HH 01	04	07	10	13	16	19	22
2	AI 2	AI 8	AIVH14	AIVH20	AIVH26	AIVH32	AI 38	AI 44
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10			.. ..	.. ..	.. ..	.. ..		
14	LXI 1	LXI 7	LXI 13	LXI 19	LZ 25	LZ 31	LZ 37	LXI 43
18	AW 2	AW 8	AW 14	AW 20	LY 25	LY 31	LY 37	LY 43
22	.. ..	.. ..	.. ..	.. ..	LR 25	LR 31	LR 37	LR 43
26					LXI 25	LXI 31	LXI 37	AVHRR
30	BIW 3	BIW 9	BIV 15	BIV 21	BIV 27	BIV 33	BIV 39	BIW 45
34	AI 3	AI 9	AIVH15	AIVH21	AIVH27	AIVH33	AI 39	AI 45
38	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
42			.. ..	.. ..	.. ..	.. ..		
46								
50	WEFAX1							
54	.. ..							
58	BIW 4	BIW 10	BIVW16	BIVW22	BIVW28	BIVW34	BIW 40	BIW 46

GMT MM	HH 02	05	08	11	14	17	20	23
2	AI 4	AI 10	AIVH16	AIVH22	AIVH28	AIVH34	AI 40	AI 46
6	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10	AW 4	AW 10	.. ..	.. ..	.. ..	.. ..	AW 40	AW 46
14	.. ..	.. ..					.. ..	.. ..
18	ADMIN0	TEST 0	ADMIN0	TEST 0	ADMIN0	TEST 0	ADMIN0	TEST 0
22								
26								
30	BIW 5	BIW 11	BIV 17	BIV 23	BIV 29	BIV 35	BIW 41	BIW 47
34	AI 5	AI 11	AIVH17	AV 23	AIVH29	AI 35	AI 41	AI 47
38	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
42			.. ..	.. ..	.. ..			
46			WEFAX3	.. ..	WEFAX4		WEFAX6	
50			.. ..	.. ..	.. ..		.. ..	
54				.. ..				
58	BIW 6	BIVW12	BIVW18	BIVW24	BIVW30	BIVW36	BIW 42	BIW 48

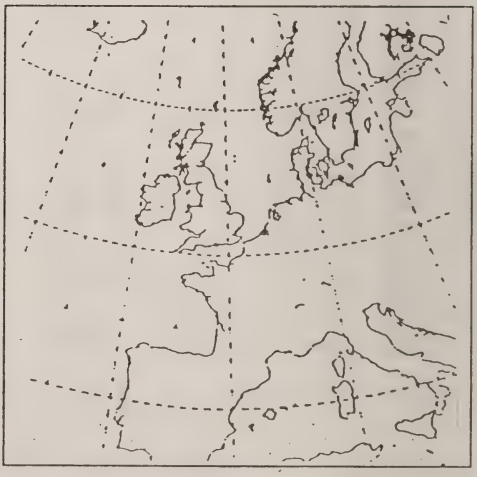
PROSAT 2

has now been released by Timestep. It is a professional type of system and costs £250. It will run on 286 / VGA + hard drive (28ms or faster) minimum machines and is now available from Henry. If you want to upgrade from PCSAT 3 you may do so for £120 but only through Timestep direct. Early comments are extremely favourable. More detail / larger pictures mean more bits -- bigger files and even more hard disk constipation! Even the edge connector is gold plated! Similar sized but different board from PCSAT 3 and even better software. More details in next Newsletter.



WEFAX FORMATS RELAYED BY METEOSAT - ADC

(C = VISIBLE, D = INFRA-RED, E = WATER VAPOUR)



EXPERIMENTAL WEFAX AVHRR FORMAT

ON METEOSAT-4, CHANNEL A2

NOAA '11' PERIOD 102.0235749 MINS INCR 25.50470 DEG

1/08 186 03:02	30/08 331 12:42	29/09 345 13:40	28/10 183 02:55
1/08 339 13:14	31/08 353 14:12	30/09 189 03:16	28/10 336 13:07
2/08 183 02:50	1/09 350 14:00	30/09 342 13:28	29/10 333 12:56
2/08 336 13:02	2/09 347 13:49	1/10 186 03:04	30/10 330 12:44
3/08 333 12:51	3/09 344 13:37	1/10 339 13:16	31/10 353 14:14
4/08 330 12:39	4/09 188 03:13	2/10 183 02:52	1/11 350 14:03
5/08 353 14:09	4/09 341 13:25	2/10 336 13:05	2/11 347 13:51
6/08 350 13:58	5/09 185 03:01	3/10 333 12:53	3/11 344 13:39
7/08 347 13:46	5/09 339 13:14	4/10 330 12:41	4/11 188 03:15
8/08 344 13:34	6/09 183 02:50	4/10 355 14:23	4/11 341 13:28
9/08 188 03:10	6/09 336 13:02	5/10 352 14:12	5/11 185 03:04
9/08 341 13:23	7/09 333 12:50	6/10 350 14:00	5/11 338 13:16
10/08 185 02:59	8/09 330 12:39	7/10 347 13:48	6/11 182 02:52
10/08 338 13:11	8/09 355 14:21	8/10 344 13:37	6/11 335 13:04
11/08 182 02:47	9/09 352 14:09	9/10 188 03:13	7/11 332 12:53
11/08 335 12:59	10/09 349 13:57	9/10 341 13:25	8/11 355 14:23
12/08 332 12:48	11/09 346 13:46	10/10 185 03:01	9/11 352 14:11
13/08 355 14:18	12/09 190 03:22	10/10 338 13:13	10/11 349 14:00
14/08 352 14:06	12/09 343 13:34	11/10 182 02:49	11/11 346 13:48
15/08 349 13:55	13/09 188 03:10	11/10 335 13:02	12/11 190 03:24
16/08 346 13:43	13/09 341 13:22	12/10 332 12:50	12/11 343 13:36
17/08 190 03:19	14/09 185 02:58	13/10 355 14:20	13/11 187 03:12
17/08 343 13:31	14/09 338 13:11	14/10 352 14:09	13/11 340 13:25
18/08 187 03:07	15/09 182 02:47	15/10 349 13:57	14/11 184 03:01
18/08 340 13:20	15/09 335 12:59	16/10 346 13:45	14/11 337 13:13
19/08 184 02:56	16/09 332 12:47	17/10 190 03:21	15/11 181 02:49
19/08 337 13:08	17/09 354 14:18	17/10 343 13:34	15/11 334 13:01
20/08 181 02:44	18/09 351 14:06	18/10 187 03:10	16/11 331 12:50
20/08 334 12:56	19/09 348 13:54	18/10 340 13:22	17/11 354 14:20
21/08 332 12:45	20/09 345 13:43	19/10 184 02:58	18/11 351 14:08
22/08 354 14:15	21/09 190 03:19	19/10 337 13:10	19/11 348 13:57
23/08 351 14:03	21/09 343 13:31	20/10 181 02:46	20/11 345 13:45
24/08 348 13:52	22/09 187 03:07	20/10 334 12:59	21/11 189 03:21
25/08 345 13:40	22/09 340 13:19	21/10 331 12:47	21/11 342 13:33
26/08 189 03:16	23/09 184 02:55	22/10 354 14:17	22/11 186 03:09
26/08 342 13:28	23/09 337 13:08	23/10 351 14:06	22/11 339 13:22
27/08 186 03:04	24/09 181 02:44	24/10 348 13:54	23/11 183 02:58
27/08 339 13:17	24/09 334 12:56	25/10 345 13:42	23/11 336 13:10
28/08 183 02:53	25/09 331 12:44	26/10 189 03:18	24/11 333 12:58
28/08 336 13:05	26/09 353 14:15	26/10 342 13:31	25/11 330 12:47
29/08 181 02:41	27/09 350 14:03	27/10 186 03:07	26/11 353 14:17
29/08 334 12:53	28/09 348 13:51	27/10 339 13:19	27/11 350 14:05

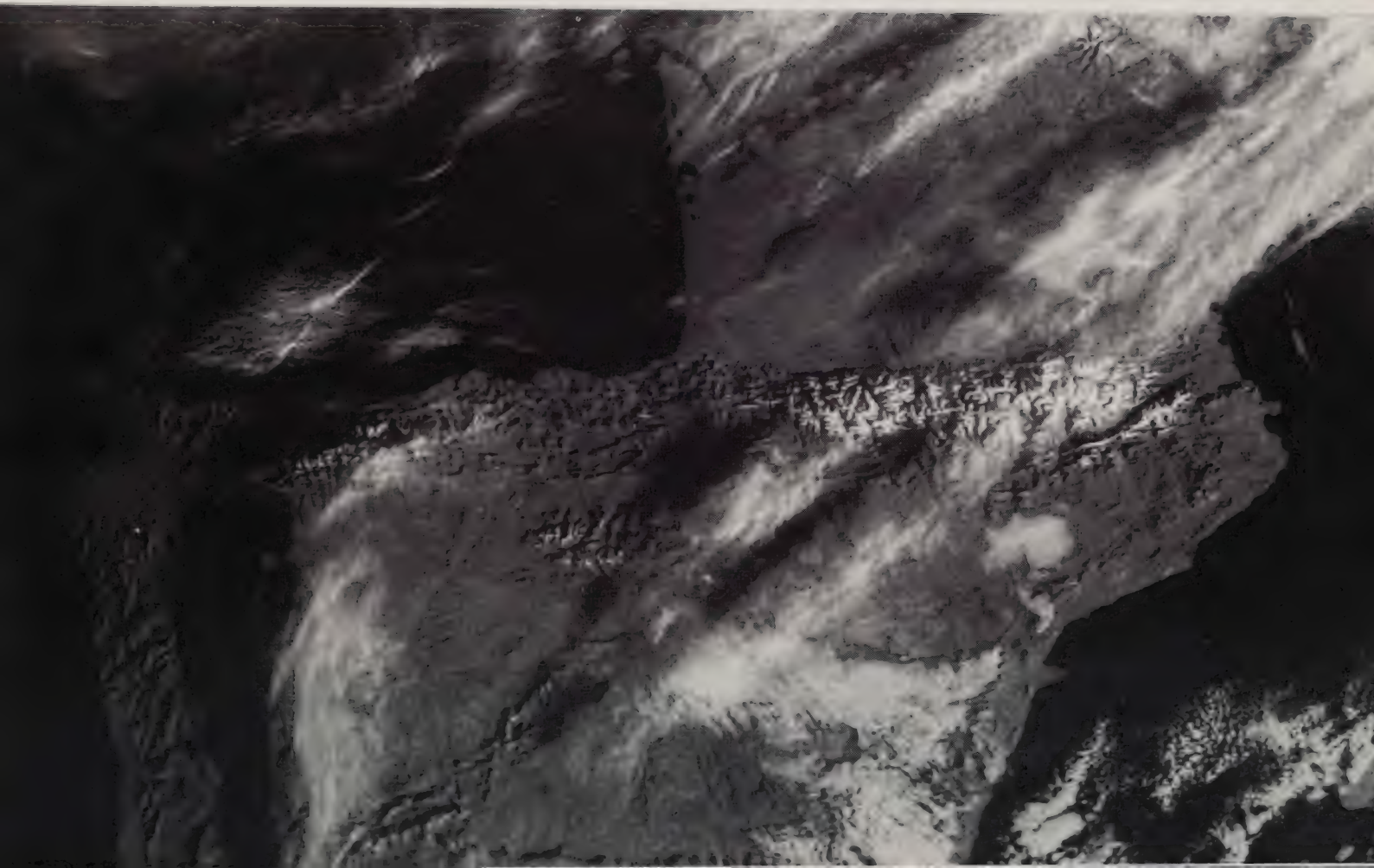
All morning passes are southbound, afternoon passes are northbound.
Frequency 137.62MHz. INCRement is degrees change per orbit.

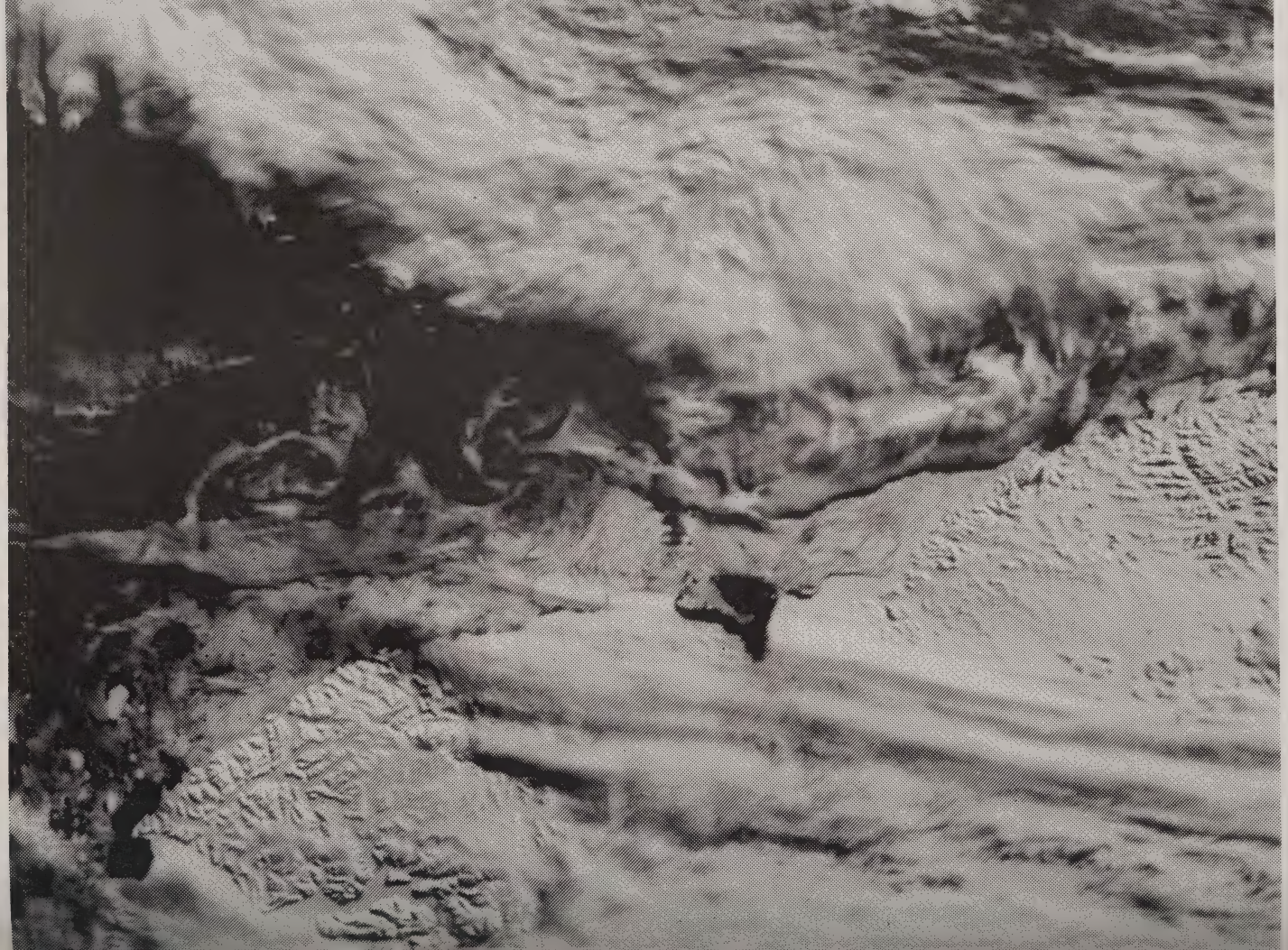
NOAA '12' PERIOD 101.35899 MINS INCR 25.3500 DEG

1/08 189 07:59	31/08 188 07:38	26/09 335 17:08	26/10 334 16:47
1/08 341 18:07	31/08 340 17:46	27/09 355 18:28	27/10 354 18:07
2/08 184 07:38	1/09 183 07:17	28/09 350 18:07	28/10 349 17:46
2/08 336 17:46	1/09 335 17:25	29/09 345 17:46	29/10 344 17:25
3/08 331 17:25	2/09 330 17:04	30/09 187 07:17	30/10 187 06:56
4/08 351 18:46	3/09 350 18:25	30/09 340 17:25	30/10 339 17:04
5/08 346 18:25	4/09 345 18:04	1/10 182 06:56	31/10 181 06:35
6/08 189 07:56	5/09 188 07:35	1/10 334 17:04	31/10 334 16:43
6/08 341 18:04	5/09 340 17:43	2/10 355 18:25	1/11 354 18:04
7/08 184 07:35	6/09 183 07:14	3/10 350 18:04	2/11 349 17:43
7/08 336 17:43	6/09 335 17:22	4/10 344 17:43	3/11 344 17:22
8/08 331 17:22	7/09 330 17:01	5/10 187 07:14	4/11 186 06:53
9/08 351 18:42	7/09 355 18:42	5/10 339 17:22	4/11 339 17:01
10/08 346 18:21	8/09 350 18:21	6/10 182 06:53	5/11 181 06:32
11/08 189 07:52	9/09 345 18:00	6/10 334 17:01	5/11 333 16:40
11/08 341 18:00	10/09 188 07:31	7/10 355 18:21	6/11 354 18:00
12/08 184 07:31	10/09 340 17:39	8/10 349 18:00	7/11 349 17:39
12/08 336 17:39	11/09 183 07:10	9/10 344 17:39	8/11 343 17:18
13/08 331 17:18	11/09 335 17:18	10/10 187 07:10	9/11 186 06:49
14/08 351 18:39	12/09 330 16:57	10/10 339 17:18	9/11 338 16:57
15/08 346 18:18	12/09 355 18:39	11/10 182 06:49	10/11 181 06:28
16/08 189 07:49	13/09 350 18:18	11/10 334 16:57	10/11 333 16:36
16/08 341 17:57	14/09 345 17:57	12/10 354 18:18	11/11 354 17:57
17/08 184 07:28	15/09 188 07:28	13/10 349 17:57	12/11 348 17:36
17/08 336 17:36	15/09 340 17:36	14/10 344 17:36	13/11 343 17:15
18/08 331 17:15	16/09 183 07:07	15/10 187 07:07	14/11 186 06:46
19/08 351 18:35	16/09 335 17:15	15/10 339 17:15	14/11 338 16:54
20/08 346 18:14	17/09 330 16:54	16/10 182 06:46	15/11 181 06:25
21/08 189 07:45	17/09 355 18:35	16/10 334 16:54	15/11 333 16:33
21/08 341 17:53	18/09 350 18:14	17/10 354 18:14	16/11 353 17:53
22/08 183 07:24	19/09 345 17:53	18/10 349 17:53	17/11 348 17:32
22/08 336 17:32	20/09 188 07:24	19/10 344 17:32	18/11 343 17:11
23/08 330 17:11	20/09 340 17:32	20/10 187 07:03	19/11 186 06:42
24/08 351 18:32	21/09 183 07:03	20/10 339 17:11	19/11 338 16:50
25/08 346 18:11	21/09 335 17:11	21/10 182 06:42	20/11 181 06:21
26/08 188 07:42	22/09 330 16:50	21/10 334 16:50	20/11 333 16:29
26/08 341 17:50	22/09 355 18:32	22/10 354 18:11	21/11 353 17:50
27/08 183 07:21	23/09 350 18:11	23/10 349 17:50	22/11 348 17:29
27/08 335 17:29	24/09 345 17:50	24/10 344 17:29	23/11 343 17:08
28/08 330 17:08	25/09 188 07:21	25/10 187 07:00	24/11 186 06:39
29/08 351 18:28	25/09 340 17:29	25/10 339 17:08	24/11 338 16:47
30/08 345 18:07	26/09 182 07:00	26/10 182 06:39	25/11 181 06:18

All morning passes are southbound, evening passes are northbound.

Frequency 137.50MHz. INCRement is degrees change per orbit.





After doing this, the devices can be handled in the same way that you would handle most semiconductors. Lay it on the two source bypass capacitors with the gate pointing to the input and solder the two source leads as quickly but effectively as possible. C3 and R5 need to be soldered together at 90°. L3 (3 turns 28AWG) is connected axially with R5 with very short leads. Leave adequate clearances from the source decoupling (C1 or C2) for L3 and connect it about 3mm along the HEMT drain lead from the centre of the ceramic package. This then fixes the position of C3 and it can be soldered to the copper. The drain lead can then be cut off as close as possible to the junction with L3. C4 (5.6pf) is the next component to be fitted and is quite straight forward. R6 and the 1.5pf capacitor need to be joined at 90°. The free end of R6 is positioned on the end of C4 with the free end of the 1.5pf capacitor on the copper. Don't move, just get them soldered in place. This capacitor is a discrete component used to replace the track/pad capacitance of the original board and it has L4 (2 turns 28AWG) across it.

The common point of R6 & C4 is the point to put one end of L5 (3 turns 28AWG). Again only short leads for this component because the gate of the second device comes next. Well not quite because you need to fit C6 & C7 at +/- 3.5mm from the centre line and offset by 3mm from the end of L5. Connect R3 220 ohms across either of the bypass capacitors to earth and then prepare to solder the second active device in. This device was is now a 72184A GASFET (marked with a "J" on the ceramic package). Be brave and get it fixed in place. A well cleaned and tinned soldering iron does this efficiently as long as it's a fine point type. R7 and C5 need to be joined at 90°. R7 is connected about 3mm from the centre of the ceramic package to the drain lead and C5 is soldered to earth. The drain lead can then be cut off as close as possible to R7. C8 (5.6pf) is connected to this point. The MAR6 is the next component. The white dot indicates the input lead and the two adjacent leads are bent downwards 90° as close to the package as possible and after 3mm bent 90° outwards. These two leads are connected to earth. The output lead is opposite the input lead. R4 (510 ohms) is connected to a 100pf decoupling capacitor at 90°. R4 is connected to the output lead, as close as possible to the package. The remainder of this lead is removed and C9 (100pf) is connected there. The other end of C9 connects to the output UT141 but not yet. The UT141 is prepared as before.

Like the input it can be connected along or through the board. If it is connected through the board a tight fitting hole needs to be drilled in the appropriate location. Solder the screen to the board (both sides) effectively, with the centre conductor touching the free end of C9.

If the board is allowed to flex in any way as a result of an external strain it would possibly fracture some of the components. It is advisable to solder or glue a reinforcing piece on the underside of the signal line. This is left to your own ingenuity. When this is complete you may then complete the signal path by soldering C9 to the UT141 centre conductor. All wiring inside of the signal path already described need to be as short as possible and as close to the dimensions given.

The DC paths for the supply then need to be completed. An idiot diode in series with the supply is some insurance. The 78L05 can be conveniently fixed with superglue so its legs stick up. R2 & R8 plus the decoupling C's C10 & C11 complete the job. The supply may be taken from up the coax, but I prefer to keep it separate. The shorting wires may now be removed. With a meter in series with the supply apply volts. If it is in the 30ma region relax. If not check it all out for faults. Connect it into circuit and hope it works!

One remaining thing is to optimise the current and voltage across the HEMT and GASFET. There is usually a very large spread in the DC values and it is highly probable that you will have to make adjustments to get the values given. The 220 ohm resistors may be left in circuit with another R in parallel. Never repeat Never disconnect any electrode without connecting a shorting wire first, if this type of adjustment is required. Connect the new R and then remove the shorting wire. This applies to R1/R3 and R2/R8 even when the supply is switched off.

If you have any way to observe noise performance, such as a noise figure meter or looking at the signal to noise ratio of a weak signal on a spectrum analyser, then the Q1 biasing can be optimised. Optimum noise figure will be near 10 milliamperes, and with around 2 volts from source to drain. The source to drain voltage is varied by selection of R2 / R8 and the drain current is varied by selection of R1 / R3. These values can be set by DC measurement before proceeding to check the noise figure.

Observe the shorting rule. First adjust R1 (a small pot is ok) for 10 mA through Q1. Then adjust R2 (again a small pot is ok) for about 2 volts source to drain. Pots (small) can be left in place for final adjustment on a noise figure meter. Minor adjustment of R1 and R2 values should produce a minimum in noise figure. Additional slight improvement may be obtained by adjustment of L2, squeezing or expanding as required. If the noise figure will not come down under about 1db, there may be a problem with Q2.

I was going to include a mechanical layout drawing but it was very simple and could be described to you. I've already mentioned the two alternative coaxial cable input arrangements (through the board or along it). The end of the cable (centre conductor) is the first reference point. All dimensions are in millimetres. From this reference point to the centre of the HEMT is 8mm. The GASFET is a further 16mm along the centre line. The MMIC is a further 9mm along it. The output is another 6mm further on making a total distance of 39mm from the input. 3.5mm on either side and perpendicular to both the HEMT and GASFET are the source bypass capacitors (C1, C2, C6 & C7) ie. 7mm apart. These are the main component positions and the others are placed as convenient.

Component list

R1 220 ohms -- a chip resistor is supplied. Adjust the current flowing through the HEMT to 10 ma by putting additional resistors in parallel with R1. A chip resistor of 220 ohms is supplied but additional resistors are not type critical.

R2 10 ohms -- a chip resistor supplied (marked 500) may be of any type. It's value is adjusted to give about 2 volts between the source and drain.

R3 220 ohms -- a chip resistor is supplied. Adjust the current flowing through the GASFET to 10 ma by putting additional resistors in parallel with R3. A chip resistor of 220 ohms is supplied but additional resistors are not type critical.

R4 510 ohms -- a chip resistor is supplied (marked 511). Any type suitable.

R5 50 ohms -- a chip resistor of 51 ohms is supplied (marked 510). A carbon composite type could be used but definitely no other type.

R6 50 ohms -- a chip resistor is supplied (marked 510). A carbon composite type could be used but definitely no other type.

R7 50 ohms -- a chip resistor is supplied (marked 510). A carbon composite type could be used but definitely no other type.

R8 10 ohms -- may be of any type. It's value is adjusted to give about 2 volts between the source and drain.

C's 1, 2, 3, 5, 6, 7, & 9 are all 100 pf chip capacitors as supplied. Please note that they are unmarked.

C4 & C8 are 5.6 pf chip capacitors as supplied.
Please note that they are unmarked.

C10 is a 1.5 pf chip capacitor as supplied. Please note that it is unmarked.

C10 & C11 -- 1uf tantalum.

C12 -- as required to suit supply system.

L1 -- 8 turns of 28 SWG over 1.3mm diameter former (use a drill as former). A length of 28SWG wire is supplied.

L2 & L5 -- 3 turns of 28 SWG over 1.3mm diameter former

L3 -- 3 turns of 28 SWG over 2.5mm diameter former

L4 -- 2 turns of 28 SWG over 2.5mm diameter former

L6 -- if required - 10 turns of 28 SWG over 1.3mm diameter former

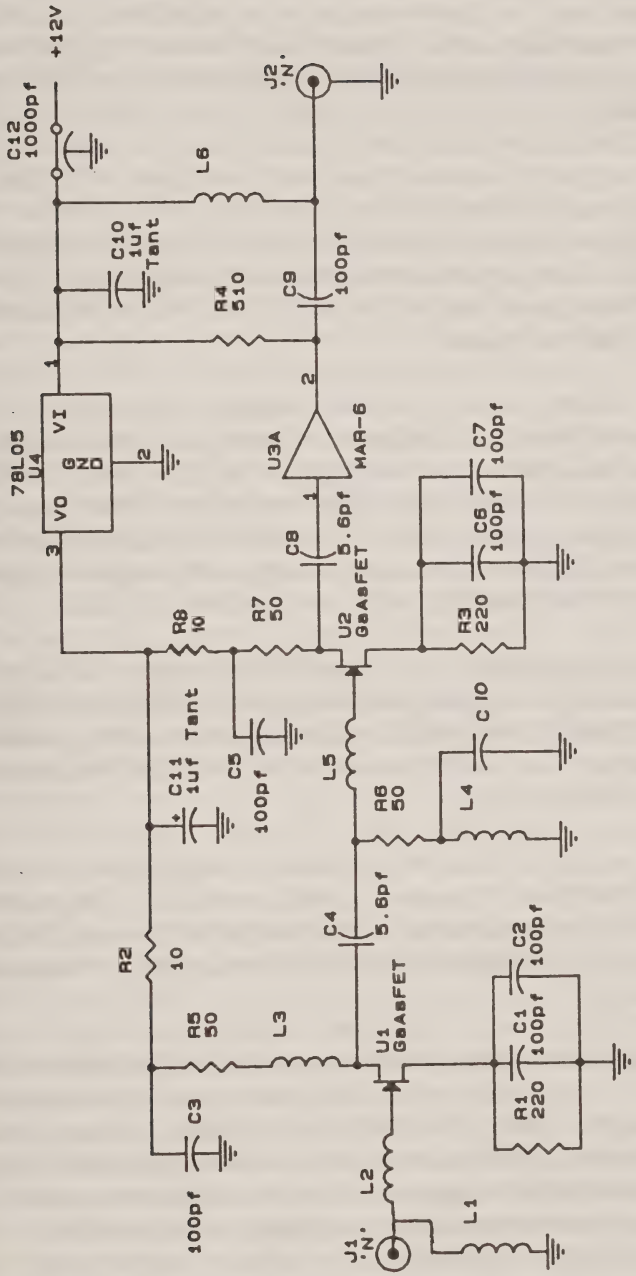
HEMT 32184A -- marked "G" on ceramic package. Supplied.

GASFET 72184A -- marked "J" on ceramic package. Supplied.

MAR6 -- usually black and marked with a white dot to indicate input pin. Supplied.

78L05

I hope that this has not been too babyish a description for you. It certainly is not a project for the faint hearted or for those with poor eyesight. It is approaching the best performance attainable by a layman and equals that of many units which have many dbs of aerial gain in front of them on nearby frequencies! If you are a beginner don't even think about this project. For those of you with a good knowledge and technical ability we sell the specialist parts. Any changes and modifications will be included with the kit when you purchase one. -


+12V
C12 1000pf
L6
J2 IN
C10 1uf Tant
R4 510
C9 100pf
78L05 U4
VI
GND
VO
U3A
MAR-6
C8 5.6pf
C7 100pf
C6 100pf
R3 220
U2 GaAsFET
R8 10
R7 50
C11 1uf Tant
C5 100pf
L5
C 10
L4
R6 50
C4 5.6pf
R2 10
C2 100pf
C1 100pf
R5 50
L3
U1 GaAsFET
R1 220
C3 100pf
L2
J1 IN
L1

MAKING YOUR OWN CROSSED DIPOLE AERIAL

Les Hamilton

RIG members may be interested in an experiment I conducted last Christmas holiday, when I spent some time building my own crossed dipole (turnstile) aerial for the reception of polar orbiting weather satellites.

I am prompted to write in response to two items in RIG 24. First, the superb image of Greenland supplied in the centrefold, and secondly John Tellick's article on extending the range of reception for Polar Orbiters. Using my home-made device, I am also able to receive Meteor images as far as the North Pole, and on occasions, as far west as Newfoundland.

Since I started weather satellite reception three years ago, I have used a Martelec aerial, which is housed indoors under the eves of the house, and an aerial supplied by Spacetech, which I have mounted at the top of my TV aerial mast. Both have provided acceptable reception, the indoor one being slightly the better. Presumably the roof mounted aerial is suffering from reflections of signals off neighbouring hardware at a similar elevation.

Anyway, the decision to try building my own aerial was in fact prompted by the news that Feng Yun transmitted a LH polarised signal. Since I did not wish to dismantle either of my existing aerials, nor buy another one for just one errant satellite, the only alternative was to build one.

Some years ago, I bought a primitive greenhouse constructed from 15 mm aluminium struts and a plastic envelope. The weather having effectively reduced the plastic cover to shreds over the years, the metal poles have lain for some time in my cellar, and were just what I needed.

The first task was to cut the metal dipole elements to the correct length. For optimum reception, each should measure a quarter wavelength. Taking 137.5 MHz as my guide, this works out at 54.5 centimetres. Four such elements were prepared, drilled, and mounted on short lengths of 5 cm square wooden spars. The two spars were connected at right angles by small brackets.

The elements were wired, with the appropriate quarter wavelength phasing loop, to a short downlead, fitted with a connector to my receiver. The whole assembly was mounted on a length of 1 cm

wooden dowelling, by means of which it could be balanced upright either against either a wall, or item of furniture. Alternatively, it could be hand-held, and directed for maximum signal strength.

The moment arrived, and I was delighted to obtain a strong signal from Feng Yun the first time I set up the aerial (this on the ground floor !). Dropout had been a problem with both my RH polarised aerials, but already (without reflectors) my home made device was giving much better reception. I also found that I could improve matters by hand-holding the aerial, and tilting it in the general direction of the appropriate horizon to improve signal strength at the extremities of the pass. There were problems, with unexpected drop-out at times. This was almost certainly due to the intervention of metal objects such as power cables behind the walls of the house. Nevertheless, the initial experiment was highly encouraging.

The next stage was to build reflecting elements, and mount the aerial assembly in a more advantageous position (in the loft), where some excellent images from Feng Yun were obtained (though all too briefly, as the satellite ceased transmissions during January). Undaunted, I reversed the polarisation mode of the aerial by flipping the top element over by 180 degrees, and tuned into Meteor 3-03, which at the time was delivering superb IR imagery of the Arctic. I discovered immediately that my range had increased by some 400-500 km in all directions. For the first time, I was receiving images from deep into North Africa,(as far south as the Canary Islands) to right up beyond the northern tip of Greenland. To the east, there were occasional glimpses of the north of the Caspian Sea, while to the west, Newfoundland and the Labrador coast could be detected on occasion.

I was puzzled, to say the least, to find that my rough and ready home-made aerial was apparently outperforming the Martelec one. This prompted me to make some measurements, and I discovered that the commercial aerial had elements only 51 cm long, which, I calculate is more suited to a transmission frequency of 147 MHz than 137.5 MHz.

Knowing almost nothing about the theory of building aerials, I may well simply have hit it lucky first time of asking. But in view of the ease with which an aerial can be cobbled together, and the enormous financial savings that ensue, perhaps this is an area worthy of further attention in RIG. Have any other RIG members experimented in this field? I'm sure a series in RIG on constructing aerials would be of considerable interest.

HRPT, A USER'S PERSPECTIVE

Stephen C. Padar
Sarasota, Florida, U.S.A

I would like to expand on the two articles on HRPT which appeared in the March 91 issue of RIG. I hope that this article will help other amateurs start HRPT stations just like I did. I am not an engineer and have no special skills in this area. Prior to the Quorum Boards this project would have been beyond my capabilities.

I have purchased the Quorum Bit synch and PSK demodulator boards from Quorum about 4 months ago. As was mentioned in the RIG article these are based on the work of John DuBois and Ed Murashi.

I had anticipated the arrival of these board and had started assembling the antenna in my garage. I purchased the feedhorn with the antenna probes from Quorum, the quadrature combiner from Minicircuits Inc, and John DuBois kindly supplied me with the cables for the feedhorn. I had an old 4 foot solid aluminium dish which I modified. Unfortunately, on the way to the welder for the attachment of a plate for the brackets, it flipped out of my trailer and the corner was dented. After a few well-placed blows from a sledge hammer I had it fixed. I then built a monopod and to this attached the feedhorn. This had to be centred at the focal point of the dish which was accomplished with guy wires and small turnbuckles. I built a waterproof housing from a 4 inch diameter thin-walled PVC pipe and mounted it in back of the feedhorn. My LNA came from Greg Ehrler and the downconverter from Quorum. The dish itself was mounted on the Yaesu 5600 Az-El rotor system, the model 5400 rotor being too small for the windloading from a 4 foot dish. I quickly realised that the dish was unbalanced, with the dish and feedhorn tending to bend it downwards. I built an H shaped support mount with counter-weights on the arms of the H until the dish was perfectly balanced in the vertical direction. I used a Belden 9913 cable for the run to the house. The whole dish assembly was then carried to the roof. It had become quite heavy by then and two of us strained to place it. The mast consisted of 1.25 inch diameter galvanised plumber's pipe and was 10 feet tall. It rested on the roof of the first story and was fastened with a bracket 4 feet from the base to the overhanging eaves of the second story. I guyed the mast in 3 directions but had no way to attach the fourth guy wire since there was no support in that direction. Bad luck (or carelessness) caused one more mishap. A windstorm from the direction without the guywire bent the mast at right angle. I had to remove the dish and replace the mast with a 2

inch diameter pipe, this time guyed in all 4 directions. Finally, I aligned the dish and connected the rotor cables to the Yeasu controller and awaited the arrival of the two boards from Quorum.

The bit sync and PSK demodulator boards arrived from Quorum and were soon installed in the computer, a 25 Mhz 386 IBM clone. I used another such clone to run the InstanTrack satellite tracking program. I copied the Quorum software on the hard drive and was ready for the first satellite. It soon arrived and since it was in the evening I attempted to copy one of the infrared channels. To my utter amazement there was a picture on the screen on the first try. I could not make out the land detail since it was evening but could discern the clouds and the snow in the valleys of the Sierra Madre Mountains of Mexico. Since then I have obtained many HRPT images and enclosing some with this article. I have learned a bit about the practical aspects of HRPT image reception.

A 4 foot dish is the optimum size for the antenna. A larger dish is too heavy for the readily available rotor systems and has too narrow a beamwidth to be of practical use. The Quorum software is quite adequate but there are two known problems. It will copy all 5 channels but cannot display them for viewing. Once the signal is acquired and then lost, as is commonly the case with low antenna elevation angles, it is difficult to restart the acquisition program. One is frequently forced to quit the acquisition program and restart it from the beginning. Once a satellite is acquired and successfully tracked it can be tracked to about 3 degrees of antenna elevation. At my location in Sarasota, Florida this allows me a view from northern Venezuela to Hudson Bay in Canada. I usually select channel two for acquisition and display during the day and channel four at night. Each channel on a full pass requires 8.5Mb of disc space. The image is written to disc as it is received. The image is available for immediate or later viewing. There are several built in palettes for viewing the image. I use the clipped palette for viewing daytime images and the linear palette for viewing the night time images. Both are grey scale palettes. The quorum software allows the saving of screen-sized images in GIF file format. This is very useful since only small portions of an 8.5 Mb image are of interest and worth saving. One can, obviously, not save many 8.5 Mb images due to storage space constraints. The image can also be displayed in reduced resolution to "appreciate the big picture".

The program also displays the strength of the received signal in bar form at the bottom of the screen during reception. This is vital to image reception since, if the satellite is manually tracked, the

antennas are moved based on the strength of the received signal. I have automated the process of image acquisition since I work during the day and can only copy the pictures on the weekends. Furthermore, on a near overhead pass the elevation and azimuth to the satellite change so rapidly that one cannot keep up with them manually. I am using a self-standing satellite tracking microprocessor, Sat Trak II described in the last issue of RIG. The tracking program is in eprom and your station location, time and the satellite Keplerian elements are programmed by connecting SatTrak II to a computer's modem port and using any modem program. Twelve satellites can be entered and the satellite to be tracked is selected via a front panel switch. Sat Trak II is interfaced with the Yeasu 5600 antenna controller and, in fact, does an excellent job of tracking the satellite.

In practice, before going to work, I start the computer and via the Quorum program select the frequency to be monitored, the channel to be acquired, the name of the file that is to be saved and the number of lines to be saved (usually 5000). I then turn off the screen to save the tube. I select the satellite to be tracked on Sat Trak II, turn on the rotors and turn on the enable switch on Sat Trak II. My LNA and downconverter are constantly turned on. When I return from work I usually have a picture. Sometimes there is no picture for various reasons, such as old satellite elements. These should be updated at least every two weeks.

I usually view the image at the end of the day in reduced resolution and then in full resolution. In full resolution, the computer screen can display only 1/50 of the image. One must scroll the image to see all of it. The image suffers from panoramic distortion at the edges and these are not usable. In the centre of the image the resolution is 1.1km. Illumination and sun angle have a great influence on the quality of the acquired image. I save a few full images on 44Mb Syquest removable hard disk cartridges and also save portions of the image as GIF files. I have a Mitsubishi P75U Video-printer. With the push of a button this device prints out an image of whatever is on the screen of the computer. The resulting image is 15 x 20 printer in size with 64 shades of grey.

After all this, is it worth it? The answer is YES! The images are of such calibre that you quickly lose interest in APT. From my location I am able to see the ABC Islands to the north of Venezuela, the Windward Islands, the dumbbell shaped island in Lake Nicaragua, Lake Gatun and the Panama Canal, the Mississippi, Hudson, Susquahenna, and Niagara rivers, Manicougan Crater in Canada, Fire Island south of

Long Island, New York. On the channel 2 reflected images I can see New York City, Philadelphia, Baltimore, and Washington. I can see the highways and the drainage canals or their ecological effects across the Everglades Swamp in Florida as well as the contrails of jets flying out of the major East US airports.

NEW STATESIDE MAGAZINE

There is a new Amateur Remote Imaging Magazine in the States called "Weather Sat Ink" aimed at the dedicated amateur and professional. Its aim is to publish the latest news on hardware, software and details of the satellites.

Details can be obtained from : Weather Sat Ink, c/o Bluebird Greenhouses, 4821 Jessie Dr., Apex, NC27502, USA. The subscription is $15.00 in the USA and $20.00 in US funds for overseas. Payment should be possible with credit cards, for which there is a $1.00 surcharge.

MEMBER'S LETTERS

Dear Editor,
I have just received RIG 24. Because of the recent changes within RIG, I had been expecting a rather skinny looking object to drop through the letter box. It was a pleasant surprise when your pint-sized phone book hit the carpet. Well done Henry. I liked the tone of the Committee letter at the front. It lays out the position well and shows nobody in a poor light. I hope RIG will now be able to continue forward from this new plateau.
I am somewhat concerned by the article at the bottom of page 14 "Interference Tomorrow" which deals with Cellular Base Stations. I would like to suggest that RIG lobby in its own interest here. I do not believe that the DTI's proposal is necessarily bad (either in itself, or for us) only that there is a danger (albeit slight) that if we do not speak up and identify ourselves and our needs then those needs may be ignored because we were unheard at the time of the decision.

Peter Ingram, Carlisle.

EXPERIMENTS WITH THE RIG LNA

Peter Hayes, GM3RAO

During the course of my attempts to receive NOAA digital pictures, I discovered the limitations of the system I was using, the Microwave Modules Meteosat downconverter and preamp. The trials and tribulations have been detailed in recent issues of RIG, and it was very apparent that while the gear was perfectly satisfactory for its original purpose of receiving Meteosat APT, it wasn't good enough for the digital transmissions from either NOAA or Meteosat. The addition of the Timestep preamp made some improvement and given a dish bigger than 2 Metres it would probably have been good enough for NOAA. However, it couldn't cope with my 1.8 M dish, and some further improvement was obviously needed, especially as I was hoping to receive Meteosat digital as well. Obviously I could throw away the MM converter and start again, but that would cost money, so a more cost effective solution had to be found.

Around this time, the RIG preamp design became available and I decided to try this. I ordered two of these, the idea at the time was to have a fixed dish set up on Meteosat where the extra gain was essential, and a steerable system for NOAA and anything else that came along, and both would require LNA's. I constructed one of the amplifiers and hooked it up to the feed and while it seemed an improvement, it wasn't good enough to resolve Met-4 digital. Much effort was put in to tweaking it up, but with little additional improvement, so still no success! All designs for LNA's at 1.7 GHz seem to use the NE720 gasfet which has a noise figure of 0.6dB at these frequencies. Although no practical amplifier will be as good as this, a final NF around 1dB would be about the best that could be expected. It seemed to me that the NE720 was now the limiting factor, and I found that the gasfets that the RSGB sell were marginally better, so I obtained two and put together the second preamp.

By this time I'd obtained a dipole feed which matched the dish fairly well, and I had this feed set up on the workbench pointing out of the window which fortunately faces south, and as soon as I switched the amplifier on I heard Met-4 APT bleeping out of the speaker at good quality. It seems either I was lucky with the construction of the second amplifier, or maybe the '1304s really are better, but now I was able to receive nearly noise free APT from Met-4 using only the dipole feed. Before everyone rushes out and builds the preamp in the hope of doing away with the need for a dish or QLY, I should add that it is not possible to reliably receive Met-4 (or maybe 5!) in this way as any

other satellite transmitting on the same frequency will ruin reception. The beamwidth of any dipole feed will be over 90 degrees so if the powers that be decide to switch on Met-3, or do tests on replacement satellites, your reception will be ruined; all you'll get is a mess, mainly the beat between the two transmissions. In the spec for ground stations, Eumetsat recommend you use at least a 1 Metre dish for this very reason. However, if you can get reasonable pictures from Meteosat using the feed alone then the system is certainly sensitive enough to be used for digital reception, and it's a very good comparative test of your preamp's noise performance.

The obvious next step was to investigate the possibility of replacing the gasfets with the new HEMT's, the NE320 series. These have a NF around 0.35dB at 1.7 GHz and using these should give a further improvement, perhaps reducing the final NF hopefully to around 0.6 or 0.7 dB and certainly below 1 dB. HEMT's are used in the latest up-market satellite TV LNAs to generate noise figures below 1 dB at 12 GHz, so if they can achieve that, then hopefully I could do the same at 1.7 GHz. Unfortunately, but not really surprisingly, the LNA suppliers were hopelessly unable to help. After a few fruitless enquiries I was pointed in the right direction by a Rig member and obtained some NE320s at a sensible price. It is not possible just to wire them in as direct substitutes, but as a starting point I replaced the first gasfet with a NE320, and arranged things so the supply rail couldn't rise above 3V, about the most you should put across one of these things. The data sheet suggested that about 50 ohms would be about right for the source bias, and this is what it turned out to be. The dimensions of L2 eventually became a bent bit of wire about 1.5cm long, and the rest of the amplifier remained the same. This worked somewhat better than the second gasfet version, and gave virtually noise free pics on Met-4 APT, again using only the feed. Note I say "virtually"; white space on IR images is the test, and if you can get clean whites then you're doing very well.

Next I tried cooling the gasfet using a Peltier heat pump chip. When a current is passed through one of these devices heat is transferred from one terminal to the other and the net effect is that anything attached to the cold side is cooled by up to 50 deg C relative to the other side, the final temperature reached depends on how much the chip is asked to cool. They can be cascaded so that very low temperatures are possible. They are used in satellites to keep image sensors cool, the CCD chips now used extensively in astronomy use them, and on a more mundane level the coolboxes powered from car batteries use them. However, I didn't find any measurable improvement using one, probably several would be needed but as

they are quite expensive I decided to abandon that line of research. It would have been interesting though to know how much improvement can be gained by cooling.

As hinted at several times in Rig, the NE320 is very "hot" and will oscillate very readily. I had constructed the "Simple Spectrum Analyser" described in Radcom, and this was very useful in spotting "sproggies" caused by the amplifier oscillating at some nearby frequency. One real problem is the amplifier box acting as a cavity and causing it to oscillate at the slightest provocation. One cure frequently used is to fit some conductive foam round the amplifier to break up the surface resonances. Alternatively, use a plastic box and see how well that does. Purists cringe now!

I don't have any test gear capable of evaluating its performance, and therefore the best guide I have is to see how well it receives Meteosat on the feed alone. The audio can be recorded for future comparison, and with care some excellent results are possible. An alternative test is to measure sun noise by comparing the receiver noise output with the dish looking at the sun, and then turned away from the sun. Make sure you don't point it at Meteosat though as the transponders are on and busily radiating noise even with no transmission. You should find the noise level changing noticeably on an "S" meter, although this is highly dependent on level of solar activity at the time of test.

Tweak up the amplifier as suggested in Rig, all the time keeping the input signal level low enough so that the slightest alteration in amplifier performance results in an audible change in the speaker (point the dish away from Meteosat if you need to reduce signal levels). As you'll have more than enough gain to overcome noise in most downconverters, what you're looking for is the best noise figure but as it's very unlikely that this will coincide with maximum gain, don't look at 'S' meters, all they will tell you is the change in the (signal + noise) performance and what we're looking for is the best noise performance. However, the FM transmission from the satellite is your best guide because its a characteristic of FM systems that any slight improvement in the S/N on a poor signal gives a disproportionate improvement in the demodulated signal. This way you should get the best settings for bias, L2 etc, always keeping the amplifier/feed combination as close to the final setup as possible. If you intend to use the amplifier on the end of a length of coax then adjust it with this coax in place. If you will use it attached directly to the feed then tweak it up in that position if at all possible. This is because the best NF is highly dependent on the impedance the amplifier sees and if you alter anything you may have to start again!!!

The bandwidth of the Rig preamp is very wide. In the original Rig article its use as a Radio Astronomy preamp around 1.5GHz is quoted (the hydrogen line frequency is 1.420 GHz), and its gain at 1.4GHz is therefore very high. Noise at 1.4GHz will beat with the downconverter's oscillator and give an output at the IF, 137.5 MHz. This noise is termed image noise and if nothing were done about it, it would degrade the signal to noise ratio at the output by 3dB. To recover this 3dB would need a dish half as big again, or double the number of QLY's! All downconverters will have a filter to keep out image noise but with an extra 30dB front end gain some image noise is bound to find its way into the IF. An additional filter between the preamp and downconverter can give an improvement out of all proportion to its cost, depending of course on how good the existing filtering is in the converter.

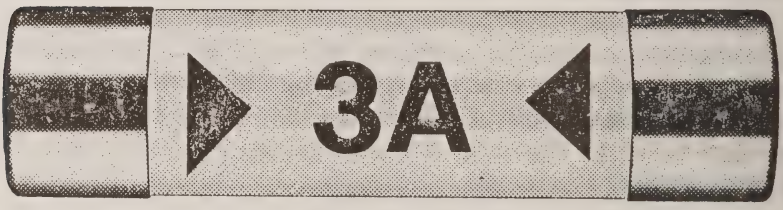
I changed the second stage to another HEMT, and although I was hard pushed to see any improvement, at least I felt I was doing the right thing, "psychological gain" if you like. However, I omitted the third "MAR-6" amplifier stage as I felt there was now enough overall gain with the preamp working ahead of the original setup. The amplifier works very well for me, but does require a lot of patience to get the best out of it. The addition of the HEMT's are only really necessary if you are interested in receiving digital transmissions and need to get the best possible results, or perhaps have difficulty installing a dish for domestic or planning reasons and have to make do with a QLY.

As I said above, I have no test equipment to give an accurate noise figure, and with the current uncertainties over the accuracy of claimed NF's for various preamps and downconverters on the market today, this is maybe just as well! It does however seem to work at least as well as the commercial products available, but the saving in cost is more than balanced by the time needed to optimise your particular amplifier/antenna combination, something no manufacturer can do. I should stress that all this is purely my own experience with the Rig preamp and other people may get different results, probably depending on how much experience can be brought to bear on the construction of the amplifier. I certainly found the first amplifier a good but expensive dummy run! Also, the gasfets/HEMT's are very delicate and need to be treated with respect when installing them. It is quite possible to damage them and they will still give some gain, but results may be disappointing, this may have been the problem with my first amplifier, and after some time they may appear to fail for no apparent reason; in truth the damage had already been done. The cause is usually too much heat when

soldering or forgetting to ground EVERYTHING when doing any work on the amplifier. I took meticulous care over the static problem, grounding the power line, grounding the soldering iron directly to the amplifier PCB and unplugging it before use, grounding all leads to the gasfet and grounding the pliers used to manipulate the components, and so far, touch wood, it's kept working!

Peter Hayes, GM3RAO

WHAT IT TAKES TO PROTECT YOUR DRILL.



WHAT IT TAKES TO KILL YOU.

WHAT MAKES YOU THINK THAT YOU ARE ANY DIFFERENT?

IT'S NOT THE ONES YOU EXPECT, IT'S THE ONE THAT YOU DON'T

MAKE SURE IT DOESN'T HAPPEN TO YOU!

JT

40

CONSTRUCTING WEATHER SATELLITE ANTENNAS

Simon Lewis, GM4PLM

I recently returned to Wxsats after a considerable break and found myself lacking a suitable antenna for the Polar Orbiters. After taking a look at the prices for a simple X type dipole array I decided to have ago at making my own.

After a good read through some of my Antenna books I came up with a list of ideas and designs that I liked. After playing around with some of them I combined them into the Antenna described here. (Fig 1). The author claims no originality for any of the designs or ideas given here!

The material for the elements and boom in my case came from a local amateur who has a number of scrap CB Antenna sitting on his garage roof. Suitable Aluminium is also available from some Antenna manufacturers. This may well be available at a local rally so it's worth keeping an eye out. Another source of suitable material is the local D.I.Y superstores. They usually stock a range of plumbing items and Copper tubing used in Central Heating systems makes good elements. This may not be as cheap as Aluminium but is worth remembering if you are having problems getting hold of Aluminium is any shape or form.

I started by constructing the ground plane section of the Antenna first. (Fig 2). As can be seen from the diagram I have used more than the normal 4 elements. From practical experience I have found this better than the normal amount, this may be due to the larger amount of metal in this section. Cut a 100 X 100mm Aluminium square up and at the centre point drill a hole big enough to suit the boom. The elements are cut to such a length that at any point around the GP they are approx 515mm long from the centre point of the plate. Each element is drilled and then mounted to the base plate. They can be secured with either self tapping screws or nuts and bolts, either method will do as long as its secure. The gp is mounted on the boom using a vertical capacitor clip. I was a little dubious of this mounting method but in practice its very secure. I shall be using that idea again!

The driven elements (Fig 3) were again made from the surplus CB antenna. The insulator sections are made from a piece of plastic from a used Muirhead Fax paper roll! - It was the only thing I had that was rigid enough and of the right diameter! Small lengths are cut off and the Aluminium pushed into them. Make sure they aren't too long and

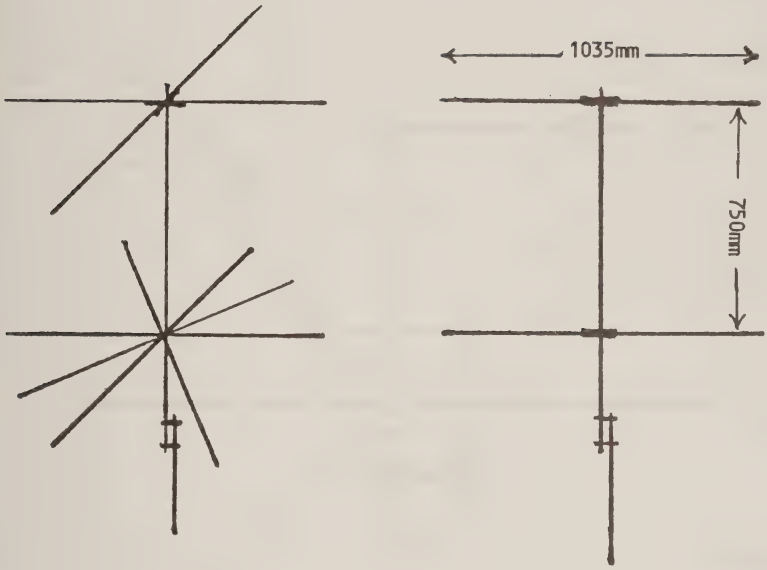
short out in the middle! If the sections are a little loose then smear a little Araldite onto them before assembly. 4 self tappers are then inserted into the insulator sections in such a way that they also pierce the Aluminium as well. The 2 inner most screws have solder tags attached for the electrical connections to the dipoles. Finally a hole is drilled at the centre of the dipole to allow it to be mounted on the boom. Don't forget to check the dipoles for continuity/shorts with a meter before final assembly.

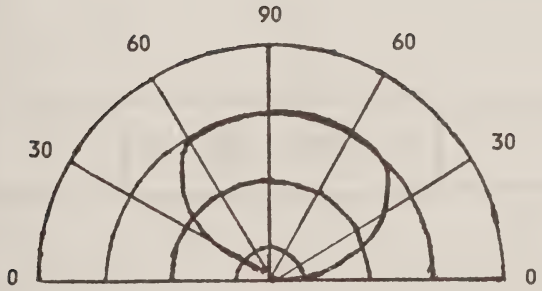
The boom should be drilled to mount the Dipoles, remember that the dipoles are mounted at 90 degrees to each other, one just slightly below the other. They should be mounted on the boom using shakeproof washers and lock nuts. The ground plane is mounted on the boom approx 750mm below the driven elements and can be adjusted by loosening the cap clip. The phasing harness is made from 2 lengths of 75 ohm cable connected as in Fig 4. This harness allows direct connection to 50 ohm coax.

Final testing should take place at ground level before the antenna is installed! On a suitable Wxsat signal finally adjust the distance between the dipoles and ground plane to give the best received signal. If it is found the antenna exhibits a poor received signal then try reversing the connections on ONE dipole. Once the antenna has been adjusted then it can be installed. It should be mounted as high as possible and away from buildings if at all possible. Don't forget to give all bolts a final tighten before installation!

In use the Antenna works as well, if not slightly better than a borrowed commercial version (the extended gp?). Using the X type dipole has also reduced some of the terrestrial based interference I have been suffering due to the radiation pattern of this type of Antenna. As I said earlier I claim no originality for any of the designs or ideas apart from the concept of bringing them together to form a sort of 'Super Sat' special! So if you fancy a cheap Wxsat Antenna then grab your hacksaw and find yourself an unused CB Aerial! Mine cost me a total sum of £1.50 for the Araldite, a lot better than £30+ for some commercial antennas, and a lot more fun!

Next on the drawing board is an 'El Cheapo' dish feed for Meteosat use. I have found a good source of suitable cans since the birth of my 1st Harmonic - Baby milk tins! I will write up my findings once I have hold of my 4ft dish that's sitting on a mast near here! Hope my Estate's big enough!. I have also been playing with Quadrifilar Helixes too, these are very odd but also interesting and I will let you know how I get on soon!.





X DIPOLE RADIATION PATTERN

FIG.1

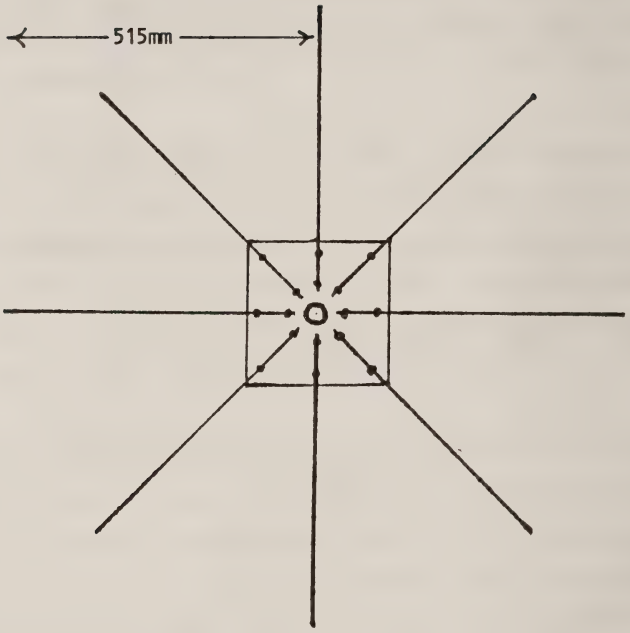


FIG.2

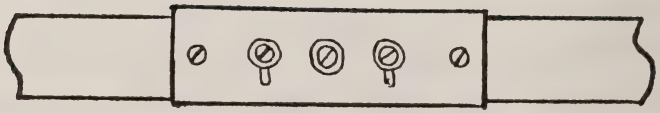


FIG.3

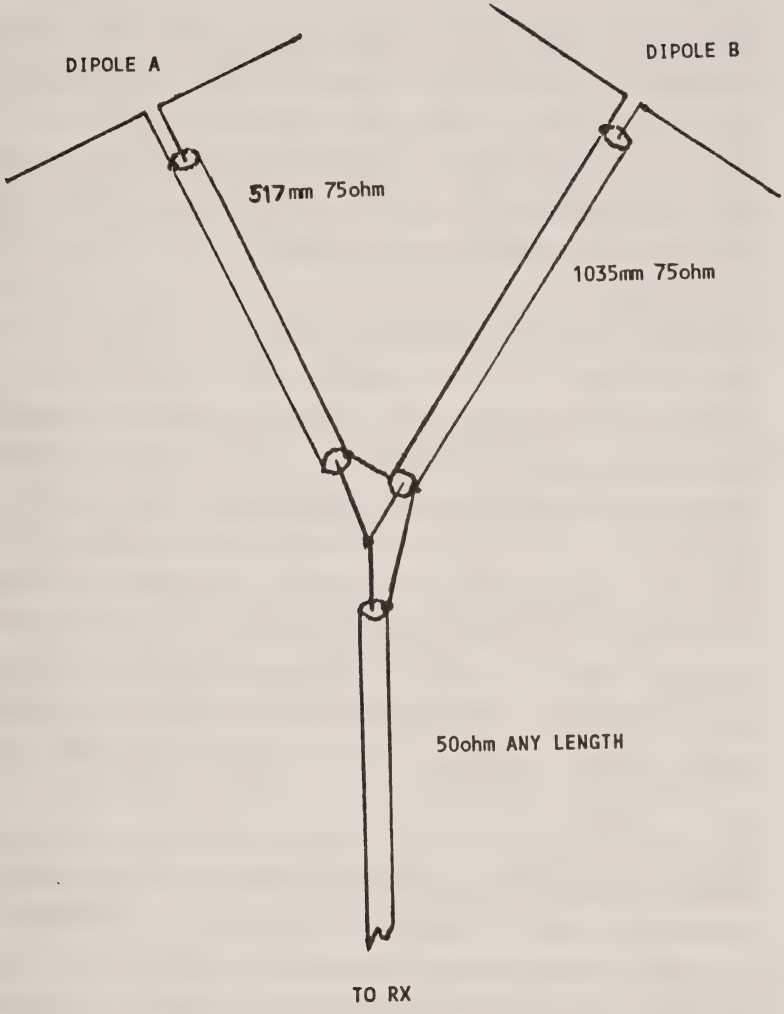

DIPOLE A
DIPOLE B
517mm 75ohm
1035mm 75ohm
50ohm ANY LENGTH
TO RX

FIG.4

AMIGASAT Ver. 2.0
Gordon Fleming G0IIG

By now I expect quite a few of you will be enjoying the latest update of AMIGASAT, the weather satellite package for Commodore AMIGA computers by Geoff Hatto & Martelec. To those of you who have not yet updated, I can only say that you are missing out, so the sooner you raid the piggy-bank, sell the family silver, to raise the update fee of £10 which you send to Geoff at his address, the sooner you will be getting to grips with the latest state-of-the-art software to receive and process satellite images on your AMIGA.

I must point out right away however that in order to fully utilise the updated version you need to have at least 1Mb of memory, and 2mb would be better. The more sophistication, obviously the greater demand upon memory. I have only 512k on the basic machine plus another 512k on the expansion port in the 'trapdoor' underneath, but I have realised that to fully exploit the latest version of the software I will need to think about getting more memory. The most logical way would seem to be by purchasing the Commodore 20 Mb A590 Amiga hard drive, in which you can also add up to another 2Mb of ram chips, and as Geoff pointed out to me, if the drive ever becomes full, it has a SCSI interface which allows further devices to be 'daisy-chained'. Those of you who are computer literate will understand what is needed and can possibly think of better ways of increasing memory. The benefits of extra memory will of course often mean that some of your other software packages will be enhanced.

Geoff has done a complete re-write of the software for version 2.0, and it certainly shows. I'm sure after speaking to him that he hasn't finished even now, and will continue to improve yet further on the package in the future. Feedback is very important to him, and I know he is very pleased to get letters from users with constructive comments or criticisms of the programme, some of which may then get incorporated.

Don't expect Geoff to answer queries by post though, as he reckons that if he stopped to answer letters, there's be no programming done! Better to try and meet with him at a Rally or channel your problems through RIG if you are a member. Geoff is fully conversant with the technical aspects of remote imaging, which together with his expertise in programming the AMIGA, brings to us what I consider to be the most interesting weather package that we 'Amigans' could hope for. It's not as inexpensive as some would like, but I'm not aware of any competitive package.

The update incorporates all the usual functions of the earlier version: SAMPLE-LOAD-SAVE-DISPLAY-IMAGES-CONTRAST-STRETCH-COLOUR IMAGES, and with limited memory you can still do some of the new functions, but improved filtering techniques and multiple images, the most fascinating part of the update, will push you into getting the extra memory.

There are now six filters, one of which is user definable,and when you have read the manual that comes with the disk and learned how all this filtering works, I'm sure you will come to agree with me that some fantastic tools have been put at our disposal to create improved images. The filters are labelled as: SMOOTH, EDGE ENHANCE, MEDIAN, ANTI-FADE, LINE FIX, USER-DEFINE. I'll try and give a brief description of each.

SMOOTH: This filter reduces the effect of high-frequencies, smoothing the image.

EDGE ENHANCE: This enhances high-frequencies, the edge detail.

MEDIAN:This also operates as a smoothing filter, but by comparing all the pixels around and including the current pixel, comparing them in order of magnitude, and selecting the middle one.

ANTI-FADE: This one reduces the effect of DOPPLER fading.

LINEFIX: This takes care of occasional black dots caused by noise or drop-out. One or more passes with this, and they disappear.

USER DEFINE: This is a really great filter allowing you to filter obliquely across the image.

MULTIPLE IMAGES: Provision has been made for you to have more than one image on the screen at once. What for? I can almost hear you ask! Well these images can be full or half size, depending on what you are attempting to do at the time, and you can load a previously saved image and whilst stripping it's contrast stretch to use on another image, you can compare both images.

There has also been included a new satellite format, more like an IFF file. Version 2.0 is backwards compatible with the old SAT B format, but also now has SAT F. You will also find that when you select a picture to load that you get a small pre-view image picture appearing at the left-hand bottom part of the screen, this is really useful if you want to search a collection of disks for a particular image without

having to load the full image. I like that new feature. Some slight alterations have also been made to the file requesters.

The zoom options have been improved upon, ZOOM P2 has been scrapped in favour of more advanced techniques, ZOOM out has been added. Load Sample & Load IFF Image have been combined into one Load sample menu option. IFF images can now be loaded as grey scale satellite images for image processing.

Information windows have been changed to give more useful information. It now gives picture information for the currently selected display. The screen to back function has been improved to make it easier to access Workbench or other intuition screens. Now selected areas of one image can be added to, subtracted from or even multiplied with selected areas from another.

Images can be cloned into the display areas. The contrast stretch facility has been improved, and you can even strip a contrast stretch from one image and use it on you currently displayed image, this helps you to match and blend two images together which have obviously different contrasts.

The colours screen now has colour spread, and copy functions. Colour palettes can be loaded from or saved to a file. Colours can be strip-loaded from another satellite image or IFF file.

Well that's about it. No words can really do adequate justice to the changes and inclusions, and you will have to take it from me on trust that your money spent on upgrading will be well worthwhile, and even if you only have 1mb of ram you won't be disappointed. It's also exciting to think that Geoff hasn't finished yet, so we can look forward to more updates in the near future. Amongst other things he is thinking of an auto operation for meteosat reception.

I hope to have a fully working system at the Leicester rally, so if you are hesitant about purchasing the package or updating, come along and see for yourself. That leads me to make a plea that if you have an Amiga why not write in to let us know what use you have for it in the context of radio matters.

Lastly, if you know of anyone who has an AMIGA surplus to requirements, with 1.3 workbench, and who would be willing to let RIG have it at a bargain price, with or without monitor, please contact Henry or myself. It will save me having to cart my personal AMIGA around for demonstrations.

AN OBSERVATION CONCERNING METEOR 3-04

Les Hamilton

Quite by chance, on June 22, I played a recorded Meteor 3-04 signal through Spacetech's Archimedes Weather Satellite Podule with the automatic line synchronisation switched off, yet obtained a perfectly aligned image.

As RIG readers will know, the carrier wave used for Meteor transmissions has always hitherto deviated sufficiently from the ideal of 2400 Hz to prevent consistent alignment of image lines. In many computerised systems, this has been overcome by generating a 2400 Hz tone, and recording it on one of the channels of a stereo tape alongside the satellite transmission. On playback, this has provided a reference frequency for ensuring line sync. when the satellite signal is decoded by the microcomputer.

Such is the speed of the Archimedes microcomputer, that the Spacetech podule is able, in automatic mode, to decode the synchronisation toneburst at the start of each image line in real time, and use this to ensure image alignment.

However, it appears that for Meteor 3-04 it is unnecessary to go to such lengths. Meteor 3-04 presumably transmits with a subcarrier of precisely 2400 Hz, so that its images can now be processes as readily as those of NOAA and OKEAN satellites.

NOAA-12 LAUNCHED

On May 14th the 3,127 pound satellite was placed into a 450 nautical mile sun sychronous orbit from Vandenburg AFB, California. It is an older TIROS-N satellite refurbished by G.E. NOAA-12 takes part in the Tropical Oceans Research program, named TOGA, which will attempt to study ozone depletion, acid rain and the "EL Nino" phenomena. It only has 4 infrared channels (unlike the newer AVHRR/2 carried on the NOAA-11, with 5 channels). It also carries the Space Environment Monitor (SEM), ARGOS remote platform collection system, and microwave/infrared sounders (HIRs and MSU). APT is on 137.50 and good pictures have already been received.

AN ATTEMPT TO RECEIVE HIGH RESOLUTION DIGITAL PICTURES
By Peter Hayes, GM3RAO

Part 4: Success.....at long last!!!

Previous articles have described my attempts to receive NOAA high resolution (HRPT) pictures, and I left off last time having obtained a dish potentially capable of doing the job.

However, no matter how hard I tried I couldn't get a good enough front end to resolve either NOAA or METEOSAT signals. I even obtained a dipole feed to match the dish but the improvement wasn't enough. I had ordered two of the RIG 1.7 GHz preamps, and built one of them but it still wasn't quite good enough. I then built the second one but using the MGF1304 gasfets that the RSGB sell. Maybe I was lucky or maybe they were an improvement, but I knew as soon as I switched on that the amplifier was a lot better than the previous one. I could obtain reasonable APT images from MET-4 with the dipole feed alone; no dish. The final improvement came when I replaced the gasfets with HEMT's (noise at 1.7GHz of 0.35 db instead of 0.6 db). They're not direct replacements, for a start you have to reduce the power rail to about 2 to 3 volts or they'll burn out, but after some effort I got nearly noise free APT pics using the dipole feed alone.

The next step of course was to hook it up to the dish and hope for the best, and indeed after carefully lining it up there was the METEOSAT digital signal with little or no noise; such was the improvement that I can well believe a 1.2 Metre dish would suffice. NOAA HRPT was also loud and clear, only the tracking problem remained. Looking back on it now, I think the basic problem was that the Microwave Modules downconverter with it's noise figure of around 5db was woefully inadequate for the task asked of it. Tests with another downconverter with a claimed 1db NF highlighted this, and many mods were made to the MM converter, including removing the internal preamp, replacing the channel crystals, and a long and careful tuneup. This, together with the new HEMT headamp really worked extremely well, much to my relief after all the time spent on it.

I discovered one snag with the dipole feed compared to the tin can effort though. When the rain comes at the dish at certain angles, the feed and its sleeve balun fill with water and only clears if you blow at it! It's very difficult for a tin can feed to get water in at the feed, it's virtually self-waterproofing.
Flushed with this long awaited success, I set about building the bits

needed to convert the METEOSAT digital data into a form the framestore would understand. I had already built the circuitry for NOAA but since I now had a (nearly) continuous signal from MET-4 I decided to pursue this instead and gain some valuable experience along the way. The circuits developed by Dundee University seemed straightforward and worked first time, and come thoroughly recommended, even though they are somewhat 'old-fashioned' by today's standards. Therefore I now had 8-bit parallel data together with a plethora of control signals. Disassembling the data into a recognisable picture is the difficult bit, but out of curiosity I hooked in my BBC computer with the 'Satpic' Rom I used years ago and it produced something vaguely familiar. Although the image was covered in vertical lines generated by the various control bytes present in the data stream, it did demonstrate the way the data is coded much more vividly than the ESA manual; I suppose a case of a picture being worth a thousand words! Next I bodged my home-made framestore and this produced some superb results.

At present I still need to do some work on data handling to unpick the various channels, but a few TTL chips enabled me to extract some of the data and to load the framestore with a 'frame' of picture. I said at the start of this series that METEOSAT Primary was more difficult to deal with than NOAA HRPT and this is certainly true. Dundee University describe a system for de-multiplexing the various signals, but this is a lot of work and would need additional effort to interface with a framestore. A computer would be ideal and if I had the cash this is probably the route I would take, but for the moment I'll make do with the framestore.

A glance at the METEOSAT schedule reveals three types of digital transmissions, types 'A', 'B', and 'LX' The 'A' format transmissions are full disc and 'B' formats are roughly equivalent to the area covered by APT D1, D2, and D3, thus giving a view of Europe and the Atlantic. There are also some LX format transmissions which are digital versions of the APT 'L' pictures originated from GOES.

METEOSAT sends its digital signals in an incredibly convoluted way. Single channels, e.g. AI (whole earth disc in IR) are easy enough, but some are less so, e.g. BIVW is Europe (roughly!) in VIs, IR and WV all in the same transmission. Matters are further confused by the seemingly bizarre technique of dividing each picture line into segments known confusingly as 'frames' and to make matters worse they call the full line a 'subframe'. To anyone brought up on the language of TV technology this is highly confusing! The subframes aren't even all the same length; 'B' format subframes are 4 frames

long and 'A' format subframes are 8 frames long. This gives you 1 TV line unless the transmission includes a full resolution Visible data when a Vis subframe is only half a line long, and sometimes there are both Vis channels. Confused? I certainly was! Twenty pages of the ESA manual are needed to explain the system so it takes some understanding!

Doubtless there are good reasons for this approach but it doesn't help when unravelling it all! If you display the TV line, sorry subframe, your picture has 4 or 8 vertical lines marring it, (sync and ID bytes, see later), so this has to be sorted out. It's handy if you want to display a small part of the picture, you can arrange for the data to be loaded into the framestore only during a specific 'frame' as each frame has its own frame number (ID). The picture of the Gulf was done that way. You will also need less memory to display only one 'frame' (360 bytes across by however many you want vertically), but Murphy's law says that the area of interest will straddle two frames, e.g. the UK in AV. Your display will need pos/neg switching if you want pictures similar to those you're used to from APT as Vis is sent inverted relative to IR and WV. Actually it's IR and WV that are sent 'the wrong way round', i.e., black space etc. Don't ask me why, perhaps the more knowledgeable can explain! The images come minus coastlines and grid references which is handy if you don't like them. Gridding is sent separately at the end of each subframe so you can deal with them as you see fit, perhaps to switch the coastlines on and off as required. However to help us through this confused state of affairs, every subframe starts with a 'label' and included with the label is data as to what is coming next so a computer will know exactly what's happening, thereby demultiplexing the relevant channel image from the two or three sent. An EPROM can be programmed to output a signal depending on the label and this can control a framestore, but there is so much data sent at the start of a transmission such as spacecraft position, sensor gain settings, etc., that a computer is very useful especially if you wan to use the images for quantitative anaiysis and not just for looking at pretty pictures!!

The full resolution of AV transmission is twice as good as NOAA APT at the sub-satellite point (Gulf of Guinea off the African coast) but by the time the picture gets to the Med it's about the same as NOAA APT and of course somewhat foreshortened, but the real difference is how clean the pictures are, truly noise-free, and indeed they will be as good as the satellite is capable of. The main advantage of digital is that the transmission path impairments have no effect so long as the system can separate 1's from 0's, and the picture quality is superb. For example you can see all along the Arabian coast to India

and down past Bombay, very foreshortened, but much clearer than any APT image. Tint it blue and you really could be looking out of the space-shuttle window!

You get full disc images in Vis & IR every half-hour at resolution somewhat better than C1D, C2D, etc, and the lack of noise makes them seem even sharper, and the full dynamic range of the framestore is used; no tweaking of gain and black level required! For those using the images seriously, calibration data is sent at the start of every transmission and accurate analysis of image data is then possible without the uncertainties associated with the analogue transmissions. In addition, successive images can be arranged to overlay each other so animation is possible without the positional 'hops' often associated with APT animation, when the computer has mis-read the sync tones.

A measure of the 'goodness' of a digital system is determined by the 'Bit Error Rate' (BER) and a good system will have a BER of no more than 1 in 100,000. Bit errors show up as black or white dots, and are the digital equivalent of noise. BER can be measured using the ATEST transmissions at 0918 & 2118. These are grey-scale images similar to the grey-scale on the APT test card, and it is possible to display this and look for any 'sparkle' on each step caused by an error in receiving the digits. A computer can be easily programmed to compare what is being received with what should be received, and work out the BER. Obviously if the BER is poor, the system will not receive sync pulses or control bytes accurately giving rise to 'glitches' in the received display, or even causing the system to 'crash', and this can be used to toughly assess the BER. Encouragingly, I have found that if the system is set up carefully, the digital system needs only to be just out of noise to get acceptable results, and as with many things digital, it works perfectly until the signal to noise ratio falls below a threshold at which it drops out.

So, with encouraging results from METEOSAT, I decided to tackle the problems with the Wireless World NOAA circuit. Although Harris Microelectronics make a chip capable of converting bi-phase (Manchester) coded signals to NRZ and would be a one chip solution to the problem, I didn't have a source of supply for this chip and I didn't know the price (and was scared to ask!!). Feedback from other RIG members suggested I was not alone in having problems with the clock circuit. The original system worked fine for a short while then for no apparent reason would stop working, and a tweak of the clock generator was needed to restore correct operation. This is no good especially if you are fully occupied tracking the satellite

with the dish. The system has to work 100% reliably, and the METEOSAT system seemed to be the answer, but before I started down that road I decided to take a long look at the now notorious FIG 14 problem. The CMOS 4046 PLL chip seemed to be a good starting point for a rebuild, and a clock built with this chip locked up every time and kept its lock under noisy conditions.

The next problem was the possible 180 degree phase error on the clock inherent in its generation. The WW Fig 14 circuit used several chips in a (to me) bizarre arrangement to detect if the clock was wrong. It occurred to me that if 3 or 4 consecutive sync pulses were not detected then you could justifiably assume that the clock phase was wrong, so an astable using the ubiquitous NE555 was hooked up with about a half-second period and the output arranged to flip the clock phase. If clock pulses arrived in the interval, they would reset the '555' and no correction would be made. This works a treat and is also 100% reliable. These changes, together with a general tidying up of the lay out resulted in a system that works every time and can be left to get on with its job.

NOAA HRPT sends 5 channels of data, but unlike METEOSAT, selecting the wanted channels is even easier than selecting Vis or IR on the APT transmissions. After the sync word, spacecraft data is sent, then the image data in the sequence, CH.1, Ch.2... to Ch.5. then back to Ch.1 again. Divide the 'word valid' signal by 5, reset the counter by the sync word, and the first word is channel 1, and so on. This works beautifully, and can also be left to get on with its job during a pass. The results are superb, the improvements in resolution, together with the lack of noise makes all the efforts well worthwhile. The improvement is so great it's like comparing colour TV to black and white, or stereo sound to mono; once you have experienced digital transmissions there is no way you will want to return to APT.....so be warned!!!

METEOSAT data is sent in 8 bit form and slots in nicely to the average frame-store, but the NOAA data is sent in 10 bit form so unless you have a display capable of 1024 grey levels (!!) or a 10 bit to 8 bit converter, a decision has to be made as to which two bits to jettison. I have found that for most daylight passes the 'upper' 8 bits give good results, i.e., losing the least significant bits, although this can make the land appear a little dark, but for NOAA 10 or NOAA 12 passes at sunrise or sunset, converting the top 3 bits to white as MSB, plus the remaining 7 bits improves the picture no end. The picture of Wales and SW England was done that way. You can't unfortunately just throw away the top two bits; if you do then any

cloud, or whatever's too bright will appear as a black blob and the screen will look as if some horrible disease has broken out. This applies mainly to the visible light channel only and other channels are best treated as for daylight passes.

The other decision you have to make is what part of the transmitted image you wish to display. Since the satellite sends 2048 pixels per line on each channel and most displays are 512 or so wide, you have to make a careful choice of when to start a line. If you are using a computer with the data on a hard disk it's easy enough to have another go if you get it wrong the first time, but for us lesser mortals there's no second chance. However it can be arranged that the start of the display is delayed by an amount related to the satellite's EQX and this also works admirably. As a guide to the size of display required, the British Isles will just fit into a 1024 x 1024 display with a little to spare down the sides. Compare this with APT where a display width of 600 pixels covers most of Europe from Moscow to the Atlantic!

This saga has shown that the major hurdle to be overcome before you can receive NOAA HRPT is getting enough signal in the first place, thereafter the problems are minor. A computer is certainly ideal for storing and manipulating the data, but you can get some splendid results without one; after a few passes you soon get the hang of how to 'programme' the framestore to show the area of interest. To receive and display HRPT you need a decent antenna and preamp ahead of your downconverter, you need to buy or build a receiver capable of dealing with the phase-shift modulation, do some digital signal processing, and figure out how to get the data into your particular design of framestore. It can certainly be done without the need of any computer; you will need computer and archiving facilities though if you want to use the data seriously, e.g. vegetation analysis. Assessing costs is more difficult as it depends very much on what the individual has by way of a 1.7Ghz set-up. Aside from antenna and downconverter costs, the extra stages to receive and process the signal should not cost very much, especially if you have a well-stocked junk box, as there are no 'exotic' components. You will also need a good oscilloscope and a fair understanding of what you are doing, and if all is well you will be rewarded with 10 bit parallel data and horizontal and vertical clocking pulses for the framestore, but the nitty-gritty of how you get the signals into the framestore depends very much on its design. METEOSAT needs more digital work, and probably a bigger dish as it's several db's weaker.

One thing though, I found it very frustrating to have everything working fine, only to have to guess where to point the dish and more often than not to guess wrong!!! I now have tracking information fed back to the dish to help me point it, but 2.5 square metres of aluminium is very difficult to control in anything more than a breeze. Were I doing it all again I would deal with the problem of tracking the satellite first so I had a good reliable signal before doing any other work even though it may not be so much fun that way!

Since the problems of steering a 1.8M dish are mechanically quite tricky, especially in an area where 70 knot winds are not uncommon, I have recently started to investigate the use of the ubiquitous Quad Loop Yagi, otherwise know as 'parrot perches', and I've found that nearly noise-free pictures are possible on a favourable pass using one 30 element QLY with dimensions similar to Henry Neale's design published in Rig13. One 55 element Yagi also works tolerably well and would give noise-free pictures if it were not for polarisation fluctuations. These fluctuations means that 2 QLY's or yagis arranged for RHC is virtually essential. If I can get two to work it will simplify tracking problems enormously, and leave the dish free for METEOSAT digital which needs the extra gain. As a guide to the 'goodness' of your 1.7 GHz system, if you can receive reasonably noise-free APT pictures from Meteosat with a dipole feed alone, or perhaps with an embryo QLY, say driven element plus reflectors and a couple of directors, a 1 Metre dish with a suitable feed should put you in business, including overhead passes which can be quite tricky otherwise. Feng Yun2 is less of a problem though, being stronger and not so prone to polarisation fluctuations, and should be receivable on one yagi, given a good headamp. A point often overlooked is that the full resolution of the satellite, 1.1Km, is valid only at the sub-satellite point, points east and west being progressively foreshortened, so getting the best pictures of the UK will require a system able to handle the rapid polarisation changes during overhead passes. This foreshortening, the 'milk bottle' effect, is corrected by the satellite on its APT channel, but HRPT is sent uncorrected. Some evidence of the 'milk bottle' effect is noticeable in the off-screen photo of Ireland; the UK is a little compressed and Ireland is a little stretched, especially down Bantry Bay way. Depending on its design, it may be possible to fit a 'warp' facility to a framestore to correct for this effect.

The photos are of Wales and the West country form NOAA10, note the shadows of the clouds, Ireland from NOAA 11, and the Gulf plus an early morning full earth image showing midsummer sunrise

over Africa (courtesy of Met-4). They give an idea of what is possible with simple equipment, but can't do justice to the superb picture quality possible from these digital transmissions. Note also; no coastlines or gridding on the Meteosat pictures. Although theoretically you can get rid of the gridding in an APT image, you lose half the vertical resolution in the process, this way you have the option at no extra cost.
It is possible that I could make receiver and digital systems available to RIG members, but you will need some knowledge of how to interface the digital signals to you framestore, although it may be possible to give an outline especially for the YU3UMV framestore. A pre-aligned receiver, 137.5 MHz in to TTL level, data out is also possible, and could work with some computer systems. These systems will also work with METEOSAT, but you will almost certainly need a bigger dish to cope with the weaker signal.

FOR FREE...

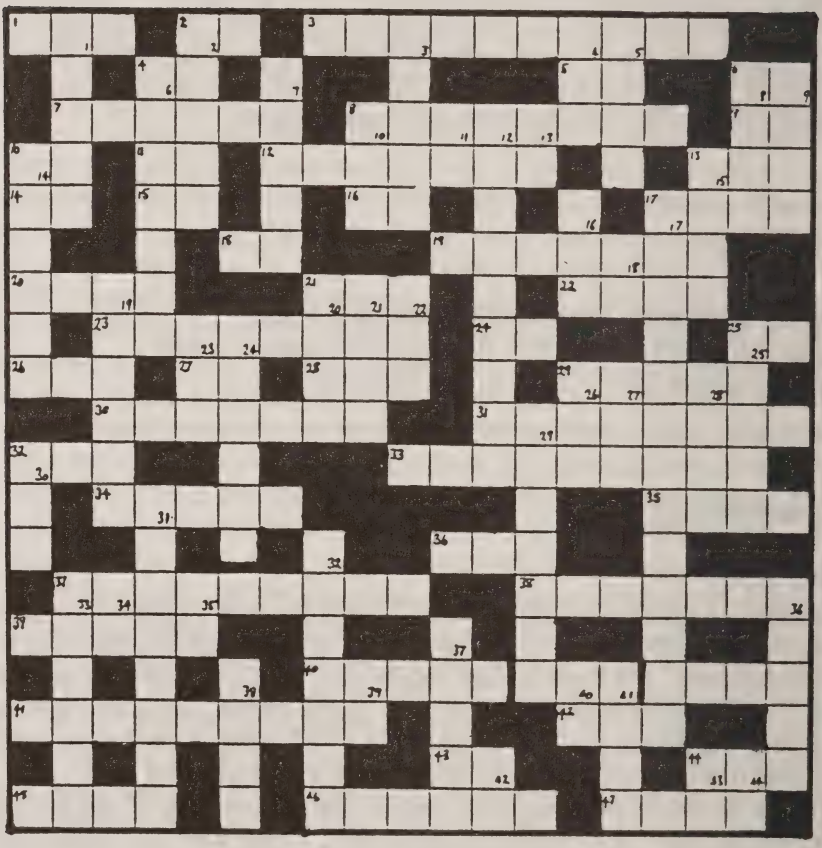
2 Rolls of Panaflex Electrostatic Recording Paper
Type FM/50, Size 8.5" x 100 metres, Free to good home!
Contact Grant Dixon, G8CGK) Tel: 0989 62715

MEMBER'S LETTERS

Dear Editor,
All weather satellite monitors have a need for reasonably up-to-date Kepler elements with which to use for accurate computer predictions. Unfortunately, the ones published by RIG tend to be several weeks old by the time the magazine arrives. [Best we can do in RIG due to printing deadlines, but the Chairman's RIG bulletin board should be up and running soon with the latest Keplers to download, Ed.].
Thanks for the latest magazine. I would like to comment on the points raised by the Committee. Personally, I can see no objection whatsoever to having any person on the Committee who is prepared to uphold the aims of the organisation and its constitution. If he or she also happens to run a business which includes the sublect of the Group I still cannot see a problem. The Committee is not one person - it comprises a number of people who are free to decide matters and overrule anyone who might try to gain unreasonable advantage from Committee membership.
Lawrence Harris, Plymouth.

RIG CROSSWORD

By Gordon Fleming
G0IIG



ANSWERS IN NEXT ISSUE

CLUES ACROSS.

1. P.C.B. ORIFICES (3)
2. U.K. ALTERNATIVE (2)
3. LIGHT MEETS DARK HERE (10)
4. SORT OF RED (2)
5. AT END OF LINE (2)
6. METRIC MEASURE (2)
7. AT SOME DISTANCE (6)
8. MOVED YOUR IMAGES (8)
9. OLD AGE BEGINNINGS (2)
10. SALLY FORTH (2)
11. GOLD (2)
12. CHINESE ORBITER IN REVERSE (7)
13. ORIENTAL COOKER (3)
14. TWO COMPASS POINTS (2)
15. DOCTOR (2)
16. HOLY TEACHING (2)
17. COULD BE A HOWLER (4)
18. SCREEN COORDINATES (2)
19. THIS IS CHANGABLE (7)
20. NOT A CITY (4)
21. GLOBAL HEALTH BODY (3)
22. PRIVELEGE BEGINS HERE ? (4)
23. WE HAVE ———— (8)
24. MOISTURE MEASURE (2)
25. 3.142 (2)
26. FASTER THAN WALK (3)
27. AMPLITUDE MODULATION (2)
28. HERB (3)
29. FULL IMAGE (5)
30. SOUND EFFECT (7)
31. AMIGA WEATHER PACKAGE (8)
32. TWO TOGETHER (3)
33. NOT MANUAL (9)
34. WE ALL LIVE IN THIS (5)
35. 'U'MISSING,CONSONANTS NOT (4)
36. THREE STATE ? (3)
37. DEEP DIVER (9)
38. 34 DOING THIS ALL THE TIME (7)
39. TAKES A HAMMERING (5)
40. 4 ACROSS IN FULL (5)(3)(4)
41. ORBITER (9)
42. DO IT YOURSELF (3)
43. COMPACT DISK (2)
44. ONE OF IMAGES,SHORTENED (3)
45. RIVER THAMES ONCE (4)
46. NO IMAGE WITHOUT THIS (6)
47. PROPAGATION TUNNEL (4)

CLUES DOWN.

1. WEATHER SATELLITE (5)
2. RIG MEMBERS IN THIS (5)
3. NO SIGNALS IF OUT OF THIS (5)
4. GET IN ON THIS (3)
5. USEFUL AERIAL SUPPORT (4)
6. WHAT HOPEFULLY YOUR DOING (7)
7. HE SITS IN OUR CHAIR (5)
8. NOT QUITE COLD (4)
9. BAKED,NOT IN 13 ACROSS (4)
10. ALL YEAR ROUND TERM (3)
11. NOT OUT (2)
12. HOVERING IMAGER (9)
13. AUDIO FREQUENCY (2)
14. VALVE EXHAUSTER (6)
15. ALERT OF 17 ACROSS (4)
16. EAT PAST TENSE (3)
17. BETTER TERM FOR 12 DOWN (13)
18. HIGH TENSION (2)
19. OPENING TO LAUNCH (6)
20. WITHOUT THIS WE CAN'T JOIN (4)
21. 24 TODAY BUT ONLY ONE (4)
22. FIRST NUMBER TO YOU (3)
23. FABRIC PILE (3)
24. FORCES ON (6)
25. SOMEWHERE IS ONE OF THESE (5)
26. BOY'S NAME (3)
27. DESERT WITHOUT DEN (3)
28. CONTINENT (4)
29. DISPLAY DEVICE (7)
30. 1 + 365 = THIS (3)
31. HIGH MOVERS BACK LATER (8)
32. PREVENTS EXCESSES (7)
33. ORBITER IN GESTAPO (6)
34. TANNING LIGHT (2)
35. 6 ACROSS PERHAPS ? (2)
36. POWERFUL WIND FORMS (5)
37. PUT UP (5)
38. REMOVE PART OF SIGNAL (4)
39. DIRECTION NORTH OF EAST (2)
40. EDWARD WITH PARTS MISSING (2)
41. EARLY SATELLITES HAVE THIS (4)
42. FROM,FRENCH VERSION (2)
43. ULTIMATE ACCOLADE (2)
44. INFORMATION TECHNOLOGY (2)

GOOD LUCK WITH THE CROSSWORD.....

THE LATEST ON METEOSAT-5
From a letter to Mr.Ingram from Eumetsat

Regarding Meteosat-5 image anomaly investigation, it has been discovered that when processing image data from Meteosat-5 the predicted position of the Northern horizon, as computed by the real time image rectification process, in most cases does not coincide with the Northern horizon as detected by the IR and WV channels. This registration error is of the order of two image lines. When the same prediction exercise is carried out using data from the visible detectors the horizon behaves as predicted, i.e. the visible channel appears to behave normally. Other effects noted are that this Northern horizon registration error varies cyclically with a period of between 60 minutes and several hours. Furthermore, the Eastern and Western horizons of the image, when computed at the equator, also vary but move in phase (i.e. both move East or both move West), the amplitude, however, being lower than the apparent N-S horizon movements. The IR grey level count average taken on the Earth disc, near the sub satellite point also varies from image to image. The variation in grey level appears to correlate with the horizon variations. In all other respects raw images appear to be of good quality and there are no grey level variations apparent to the eye within an image. It is now considered that this anomaly is not caused by any movement of the satellite in its orbit. Additionally, the ground segment is also currently excluded as a probable source of the anomaly since Meteosat-4 and 5 have been interchanged with respect to the same ground segment processing chain. The problem is not seen on Meteosat-4. The actual cause of the image anomaly is not yet identified. The anomaly seems to have some temperature dependency and the most likely part of radiometer which could cause anomaly has been identified. The anomaly seems to occur after the splitting of the image between the visible and IR/WV detectors within the radiometer and before the recombination of the image signals within the radiometer electronics package. The current hypothesis is that the anomaly could be caused by a small (5mrd) rotation of the detector assembly. The cause of such a rotation is not, however, clear but might be caused by damage to one or more assembly supports. Further longer period tests may be required to fully understand the problem and to model the anomaly in detail. It should be noted that the impact of the problem is restricted to image animation (where image movement can be detected) and the extraction of cloud motion winds. It is considered that it will be possible to mitigate these effects by image processing software developments, meanwhile individual images could be used normally.
Gordon C.Bridge, MOP Mission Manager.

PCSAT III - THE STORY SO FAR (AND OTHER BITS)

Written by those awfully nice people at Timestep

RIG members have obviously taken to PCSAT III. In less than a year over 120 RIG members have purchased a system.

The PC is the ideal platform to display Weather Satellite images. Even cheap video cards can display 1024 pixels 768 lines and 256 colours. This resolution beats all other domestic computers very easily.

Buying a PC makes sense for the future too. HRPT is now available; only on the PC. Timestep will have Meteosat Primary Data on the PC in a few months. No other computer can support HRPT or Primary Data.

During the last few months we have seen Meteor 3-4 and Okean 3 come into use. Updates for these programs are available from Henry Neale. Because all the signal processing is performed by the PC a new satellite only needs a software update. Timestep will support any future satellite. If we haven't received it, simply send us a good quality TDK, Maxell or Sony tape or any DAT tape and we will issue new software. Les Currington alerted us to Meteor 3-4 and we had the software 2 days later. RIG members have never had it so good !

Recently new video cards have come out that the original program did not support. SATSHOW is now available to use ANY new VGA card.

Animation is now available in full screen format with up to 100 frames, and with only 640K of memory provided you have a hard drive.

A new public domain software package will allow even better laser dumps than the Timestep version, OK it takes a bit longer but the results are worth it. For all the above updates contact Henry Neale.

A word of warning for computer purchasers. Would you knowing nothing about cars AND unable to drive, buy a car at an auction ?? Of course not ! Why then would you go to the cheapest supplier of computers and be surprised that you get no support ?

The moral is simple, if you don't know much about computers go to your local dealer and ask. DO NOT go to a discount shop.

The main cause for complaint is that the computers do not have much free memory. To run PCSAT III you need about 570K free. Do not use DOS Shell and do not stuff your CONFIG.SYS full of rubbish.

We cannot support DR DOS at all. In our opinion MS DOS does everything very well. There are no problem with MS DOS 4.01 or 5.0. Do not run ANY TSR's and try to learn DOS. Norton, PC Tools and XTREE are not a substitute for good old fashioned DOS. They will mislead you and cover up problems. Learn DOS (just like you learnt to drive a car) and learn how to use batch files to load and run programs.

If your video card is giving trouble on any satellite, first report accurately the problem to Timestep or Henry Neale. Switch to IBM 640x480x16, receive the image and then use SATSHOW to show the image in the highest resolution your graphic card will allow. This gets you the very maximum resolution with the least hassle. Use a batch file to automatically load SATSHOW after exiting your capture program.

Users will know that we ask for comments on the return form. We noted all of these and a lot have been answered by the updates listed above. A few were beyond the scope of the original software and card. For those users with very special requirements, we now have a new version available incorporating VGASAT IV and MegaNOAA, this package is called PROsat II and is VERY expensive. PCSAT III is still the recommended entry point and will be in production for the foreseeable future. Don't buy PROsat II unless you really need it !

PROsat II has latitude and longitude gridding on NOAA. It has temperature calibration on NOAA (accurate, not estimated). It has full image processing and 3D. The features are complex and we suggest you write to Timestep for a colour brochure that fully describes the system. PROsat II will be available from Henry Neale at special RIG prices from the end of August.

At the Leicester show we will be showing images from PCSAT III, PROsat II, HRPT and Meteosat Primary Data. Please come along and ask questions !

Keep writing to us and we will do all we can to make the PC platform even more unbeatable !

HRPT SOFTWARE

Dave Cawley

This article describes the software supplied with the Timestep HRPT card.

As readers may know there is at least one other supplier of HRPT systems. Originally John DuBois and Ed Murashi wrote some simple software to drive their HRPT card. Some manufacturers have simply modified this early test software and released it. Rather than take this short cut, Timestep completely re-wrote the software from scratch.

One of the biggest problems was that the original software would not tolerate ANY loss of signal during a reception period. This had the unfortunate consequence of losing a long pass completely. The Timestep software will automatically regain synchronisation from any fade or loss of signal without losing the original data.

File export is also very important. It is possible to export any section from any band into the Timestep PCSAT III format or as a binary file of 1024 x 768 x 256 for use with VPIC.

Immediately after reception the Timestep software applies geometric correction to regain the correct aspect ratio of the image and also completely compensates for the panoramic distortion produced by the satellite's scanner.

Any number of bands can be stored and any band displayed whilst receiving. After reception any band can be viewed in full resolution. A "roaming zoom" mode is available that allows you to pan across the entire image from the hard disc file.

Fully automatic temperature calibration is built in to allow land, sea and cloud temperatures to be measured to better than 1 degree centigrade. Because the image has no noise, minute sea currents can be monitored by their change in temperature. We have a stunning image of Iceland that shows incredible detail and extremely interesting sea currents.

A temperature slice allows bright colours to show small changes in temperature, revealing currents otherwise invisible in shades of grey.

Fully automatic gridding is employed to give a projected latitude and longitude scale on the screen. A mouse pointer allows accurate

readings of "spot" latitude and longitude. This feature combined with temperature readout, allows for example, the accurate position of sea temperature changes to de determined.

False colour is available from any band. Band 2 images can look amazing in the summer ! Contrast stretch and fully automatic histogram equalisation is available so that even small towns can be seen as Urban Heat Islands on Infrared Images. Histogram Equalisation also allows significant land detail to be displayed even in winter evenings.

There are several palettes supplied as well as the equalisation. As many palettes as you like can be generated and stored. Appropriate palettes can be stored with the same file name as the image allowing them to be automatically loaded in the future.

All known VGA cards are supported including the Hercules Graphic Workstation card that can display 1024 pixels 768 lines and 256 colours OR 256 grey shades. For most users a Tseng Labs 1MB ET4000 card costing about 100.00 is the best though. This card will show 1024 pixels 768 lines and 256 colours or 64 grey shades. Remember in the zoom mode every pixel is shown.

The best bit we have left to last ! How do you perform all these software functions, SIMPLE, by using a mouse and pull down menus, then selection options. If you have ever seen or used Windows 3.0 you will feel completely at home. The software is easy to use and naturally intuitive. Full on line context-sensitive help is available as well.

A few people have asked about the hardware. Most answers are in previous issues of RIG. The card and software can be used to upgrade other manufactures systems since it takes raw demodulated data. The receiver is a stand alone unit that sits outside the computer. It has a good looking front panel with a moving coil signal strength meter, a data present LED, a power switch and LED, a level control to compensate for feeder lengths and the multi channel switch to select the different satellites. It looks great ! Nothing about hiding your lights under a bushel here (or in your computer) !

RIG HELPLINES:

General Enquiries	John Tellick	081 390 3315
NOAA info.	Henry Neale	0945 85 353
Russian, Chinese satellite info/status	Les Currington	0707 326058
Schools/Educational enquiries	John Murray	0803 217490
	Frank Bell	0483 416897
	Tom Walker	0734 871330
European Space Agency	Colin Hall	Home 021 449 0006

Framestore technical support:

Mike Coombs 0530 243494
7.30pm - 9.30pm

Ian Gurton 0582 713770
7.30pm - 9.30pm

Dermot Dobson
93 Old Road, Headington, Oxford, OX3 8SX

Supplier problems co-ordinator	Henry Neale	0945 85 353
RIG at Rallies 1990	Mike Coombs	0530 243494

RIG MICRO SPECIALISTS:

BBC Micro	John Tellick	081 390 3315
Commodore Amiga	James Brown	0656 712632
Atari ST, Archimedes	Peter Newman	0487 812121
IBM PC	Phil Seaford	0525 384419

Please call at sensible hours
ie 7.30pm - 9.30pm

RIG SHOP CORNER

Meteosat Downconvertor:-

a) Assembled and tested module in tin plate box:-
£147.00

b) Complete mounted in weather proof box:-
£183.00

Waterproof power and channel change connector £10.00 extra if required, but note these functions can all be done via the coaxial downlead.

RIG VHF Scanning Receiver

a) Basic receiver module, with LED Channel number display, fully assembled and tested
£128.00

b) Same module as above but with liquid crystal frequency display module replacing the LED Channel display.
£169.00

The **RIG VHF preamp** also available includes a bandpass filter and is ideal for mast-head mounting. It is available from the Chairman as a built and aligned PCB measuring 85mm by 33mm (3 5/16 x 1 15/16 inches). Module including first class post £16.00

28 page booklet entitled: Introduction to Weather Satellites & their Reception by Mike Mansfield. £2.50

Parts for **Low noise Amplifier** - see RIG 17, 18, 23 and item in this Newsletter. Orders now being taken for next batch. £28.30 approx. Enquiries re availability and final price etc. to the Chairman

David Juett YU3 i/f s/w for IBM PC & clones £6.50

Dishes, only 1.6metre available £48.00

Original Feedhorns (2 only) £36.00

ALL ITEMS ABOVE ARE AVAILABLE FROM THE CHAIRMAN

Rig Binders
Available by post from Gordon Fleming, 168 Bythway, Welwyn Garden City, Herts. AL8 1DU. Price £4.00 each, including P&P.

All Cheques payable to "Remote Imaging Group" please

RIG - Timestep PCSAT III

A small half sized PC card that will allow the display on IBM PC type computers of APT signals from Meteosat, GOES, NOAA and the Soviet polar Meteor and Okean satellites.

Card type	Half card 8 bit, plate through solder resisted
RFI	FCC part 15 and 1992 EMC compatible
Input	Two separate inputs, 100mV 10K ohm audio (adjustable)
Source	Live or from tape (no sync track needed)
Synchronisation	Derived from subcarrier on Meteosat, GOES and NOAA. From digital signal processing (DSP) on Meteor and Okean. No computer timing or calibrations used (or needed).
Resolution stored on disk	600 pixels 800 lines and 256 intensity levels
Zoom	To pixel resolution regardless of video card
Acquisition	Fully automatic on Meteosat and GOES (any PC). Fully automatic NOAA, Meteor and Okean live or tape (VGA, 286 and above only)
Printing	High resolution HP LaserJet (and clone) driver
Power	Supplied from host computer
Colour	64 greys or 256 colours from colour routine supplied
Contrast	Stretch or compression in linear or non linear
Display resolution	800 x 600 256 colours VGA
	640 x 480 256 or 16 colours VGA
	640 x 400 256 colours VGA (Paradise, Amstrad and Atari)
	320 x 200 256 colours VGA (display only, receive in 640x480x16 mode first)
	640 x 350 16 colours EGA (not NOAA or Soviet)
	320 x 200 4 colours CGA (not NOAA or Soviet)
	640 x 200 16 greys Amstrad 1512 (not NOAA or Soviet)
Cards supported	Any IBM register compatible card
	Tseng Labs chip set (Orchid, Sota etc)
	Paradise (Amstrad, Atari, Viglen etc)
	Video 7
	Trident (legal versions only) (Morse, ZyMOS)
Animation	Flicker free. Any section or zoom, 400 x 300 x 7 (VGA EGA)
Contents	Manual, PC card, software
Input connector	9 way D socket
Price	£137.50 (rally price) plus £3.50 postage and packing

Available from

Henry Neale
Thornlea Fishersgate Sutton St James
Spalding Lincs Tel. 0945 85353

AMIGASAT V2.0

This is a sophisticated satellite decode package with many clever and unique features, enabling Amiga owners to enjoy superb image quality equalling the best around, and providing image processingpower envied by other systems.

Features:

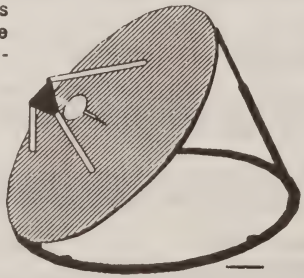
- *Extensive software DSP throughout the package.*
- *Images stored in full 8-bit resolution*
- *Preservation of original full-resolution image irrespective of subsequent picture processing.*
- *Zoom - fixed and user defined.*
- *Decodes new Meteosat digital header information.*
- *Powerful image enhancement routines, supporting multiple images, extensive digital filtering, and inter-image processing*
- *Stores images in Amiga's own IFF picture format, providing easy access to the huge array of third-party software programs for touch-up, animation, text overlay etc.*

£139.50

Demonstration Disc £5

Meteosat Dish & Feed

The MSD20 is a precision spun aluminium parabolic dish, mounted on a rigid tubular steel frame. The 95cm dish comes complete with the MSF20 silver-plated dipole feed assembly, having an N-type, 50ohm output socket.



£137.65 (next day del. & ins. £18)

MSF20 Feed only £39.50 (carr.£4.25)

Introduc

Satellite and Facsimil

This has to be the package for PC users, offering not only satellite decoding, but also a comprehensive facsimile package.

The package comprises an internal interface card containing all circuitry for AM and FM demodulation, ADC, and filtering, and having separate inputs for facsimle and satellite data.

General Specification

- *Decodes ALL weather satellite signals*
- *Decodes ALL (HF) facsimile signals*
- *Prepared for SSTV (software option)*
- *Prepared for Codebreaker CW/RTTY/ASCII (software option)*
- *Interface will fit any IBM Compatible PC*
- *Universal integrated software (copy protected)*
- *Full 8-bit hardware resolution*
- *Auto-save facility*

Digisat

This comprehensive and delightful PC compatible hardware/software package has recently been upgraded to include a printer dump facility - at no extra cost! Works up to 800 x 600, providing *unlimited* animation sequencing, auto down-loading, temp readout and lots more. **Special offer £125**

Other Products

	£
MSG20 Graphstore & Grace s/ware	347.78
Omnifax New Sat decode package for PCs	195.00
Archimedes Podule & s'ware (A3000)	295.52
" (Arc 300 & 400 series)	260.00
MSK20 VHF Preamplifier	17.00
Demo Discs: Arc (2), Amiga (1)	ea 5.00

Omnifax

oding in one package!

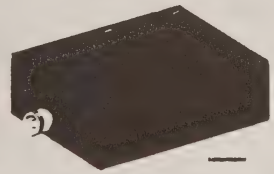
Weather Satellite Decoding: Decodes Meteosat, NOAA, Meteor, Cosmos etc., all sync tones detected. Contrast and brightness controls on interface, plus software control of brightness. Features fully automatic reception capability, programmeable timer, multi-sequence animation, and superb printer dumps for laser and dot matrix.

Facsimile Decoding: The system docdes all facsimile signals that can be received (VLF, HF, VHF, & UHF), including amateur fax, weather charts, sat photos, and press photos - including colour photos! The package provides automatic scrolling, and caters for IOCs of 144, 264, 267, 288, 353, & 576., and drum speeds of 60, 90, 120, 180, and 240 rpm. There is software shift selection of 1900 ±400Hz or 1900 ±150Hz. Choice of 4 scanning directions. Quartz stabilized drumspeed reference oscillator.

- ***Full details upon request***

Complete h'ware/s'ware package £169.95

Low Noise Downconverter

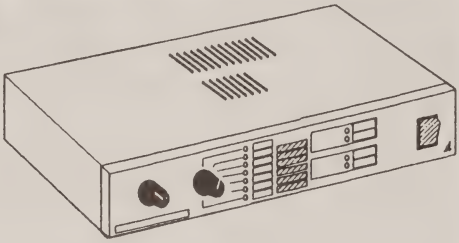


With built-in GaAs-FET preamp, and housed in a weather-proof ABS box, the MSC20 is a very low noise converter (typ. 1dB). Its temperature-controlled circuitry provides both Meteosat channels on 137.5MHz. The unit comes complete with all connectors, N-type/N-type cable, and silicon sealing tape.

£150

Carriage & Ins. **£4.25**

MSR30 Synthesized Receiver



If you're looking for a professionally- built synthesized receiver, with performance to match, then the MSR30 has to be the one. No corners have been cut to achieve the best possible performance, and a host of features including:

- *Built-in Scanner with intelligent halt (2.4KHz detector)*
- *Auto tape record facility, with adjustable noise dropout delay*
- *Auotomatic frequency control*
- *Adjustable APT output level*
- *Separate internal PSU for downconverter*
- *Tailored APT passband filtering.*

£295

Carriage & Ins. **£7.50**

Components & Miscellaneous

		£ ea.
SL6601C	FM IF	0.80
BF981	Low noise MOSFET	0.42
NE32184A	GaAs HJFET (Nf = 0.37dB @ 2GHz)	9.50
Xtals	(All common sat freq.)	3.50
NE567	Tone decoder	0.85
MSA-0835	Low noise MMIC	2.85
NE76184A	GaAs MESFET (Nf = 0.8dB @ 4GHz)	7.80
ATF10136	GaAsFET (Nf = 0.4dB @ 2GHz)	9.80
TL071	Low noise Op Amp	0.30
TL072	Dual TL071	0.35
TL074	Quad TL071	0.40
LM324	General purpose Quad Op Amp	0.25
SFA10.7	Ceramic Filter	0.85
FX1115	Ferrite Bead	0.08

Send S.A.E. for full list of ICs, FETs, Coils, Filters, Xtals, connectors

Ordering Information: Prices exclude VAT, add 17.5% to total for U.K. orders. Where not indicated, carriage should be added at £1.50. For more than one item the maximum carriage is £7.50 (£18 if MSD20 included). Overseas rates are payable at cost. Payment may be made by cheque, postal order payable to ***Martelec Ltd.***. ***Visa*** and ***Access*** cards accepted.

8 Kimber's Lane, Farnham, Surrey. GU9 9PT, U.K.

Tel./Fax 0252 737620 Mobile 0836 297252

PROLOGUE COMPUTERS LTD

2 ORCHARD RISE, OLVESTON, BRISTOL
BS12 3DY. TEL. 0454 612882/325430

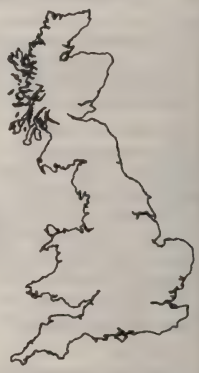
□ *COMPUTERS*

Professional quality systems at discount prices. Ideally suited for use with the RIG - Timestep PCSAT III Interface/Software, at display resolutions up to 1024 x 768 Pixels (With Super VGA monitor option).

286 12MHz. 1Mb RAM (expandable to 4Mb). Teac 1.2 or 1.44Mb Floppy drive.
Small footprint high quality metal case, 200W PSU. 3 Free Expansion slots.
14" VGA Mono monitor (640*480 pixels / 64 grey levels) Paradise 512kb VGA card.
AMI BIOS £532.00

386 SX -16MHz. 1Mb RAM (expandable to 8Mb). Teac 1.2 or 1.44Mb floppy drive.
Small footprint high quality metal case, 200W PSU. 3 Free expansion slots.
14" VGA Mono monitor (640*480 pixels / 64 grey levels) Paradise 512kb VGA card.
AMI BIOS. £720.00

386 -25MHz. 1Mb RAM (expandable to 8Mb). Teac 1.2 or 1.44Mb floppy drive.
Small footprint or full AT case, 200W PSU. 3/5 Free expansion slots.
14" VGA Mono monitor (640*480 pixels / 64 grey levels) Paradise 512kb VGA card.
(As used by RIG) £976.00



□ *OPTIONS:*

VGA Colour monitor 14" (640 x 480).....ADD £141
Super VGA Colour Monitor 14" (1024 x 768) ADD £174
1Mb Video Card (Tseng Labs - 1024 x 768 x 256 colours) ADD £35
Mini Tower Case (Leaves 5 free expansion slots) ADD £10
4Mb RAM (instead of 1Mb)..... ADD £130
42Mb 28ms Seagate hard disk ..... ADD £140
Mouse (serial or bus interface).....ADD £23
MS DOS V3.3.....ADD £49

□ *COMPONENTS:*

MOTHERBOARDS : XT-12 £56, 286-12 £96, 386SX-16 £253, 385-25 £429
VGA CARDS : Paradise 256kb (640x480x16 colours, upgradable to 512kb) £72.80
Paradise 512kb (640x480x256 colour etc.) £91.00
Tseng Labs 1Mb (1024x768x256 colours, etc) £118.75
MONITORS : 14" VGA Mono £85, 14" VGA colour £237
14" Super VGA colour £249, 14" Multiscan Colour £298
FLOPPY DRIVES : TEAC 360/720Kb £50, 1.2/1.44Mb £53
HARD DISKS : SEAGATE ST251-1 40mb 28ms £175, ST157A IDE 42Mb 28ms £157

Please call for further information on systems and components (Day/Evening)
All prices EXCLUDE VAT. Delivery - 5 Days (Components), 10 Days (Computers).

Tel: 0305 822753
Fax: 0305 860483

Space from Earth?

or Earth from Space?

Remote sensing,image processing and astronomy products for Acorn and Atari computers.

GOLD AWARD:
SPACETECH
WEATHER SATELLITE STATION.

Please write or telephone for a complete description of our range of resources, including weather satellite equipment and space-science books posters videos etc.

DEMONSTRATION DISCS AVAILABLE

HIGHLY RECOMMENDED:
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ORRERY

spacetech
Space Science Resources

21 West Wools, Portland, Dorset. DT5 2EA

TIMESTEP

HRPT System

Noise-free digital HRPT transmissions from NOAA, with a ground resolution of just 1.1km, allow images to be received in incredible clarity. Rivers, lakes, mountains, cities and even small towns can be seen on good days. Fishermen will appreciate the increased resolution of sea surface temperatures.

Image processing, including variable and histogram contrast equalisation combined with full colour editing, gives the best possible results from any image. Colour enhancement allows sea surface temperature and land details to stand out in high contrast. Any number of colour palettes can be saved for future use. The sophisticated mouse-driven software allows all five bands to be saved and displayed on nearly all VGA and SVGA cards right up to 1024 pixels, 768 lines and 256 colours.

Zoom to greater than pixel level is available from both a mouse-driven zoom box or using a roaming zoom that allows real time dynamic panning.

Sections of the image may be saved and converted to GIF images for easy exchange.

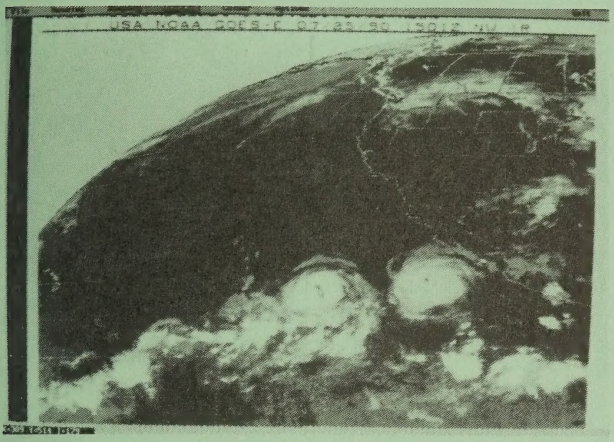
Latitude and longitude gridding combined with a mouse pointer readout of temperature will be available late in 1991.

Tracking the satellite is easy and fun! Manual tracking is very simple as the pass is about 15 minutes long. A tracking system is under development and expected by the end of 1991. A 4-foot dish and good pre-amplifier are recommended. The Timestep Receiver is self-contained in an external case and features multi-channel operation and a moving-coil S meter for precise signal strength measurement and tracking. The data card is a Timestep design made under licence from John DuBois and Ed Murashie.

Complete systems are available, call or write for a colour brochure.

USA Amateur Dealer. Spectrum International, P.O. Box 1084, Concord, Massachusetts 01742. Tel: 508 263 2145

TIMESTEP WEATHER SYSTEMS
Wickhambrook Newmarket CB8 8QA England Tel: (0440) 820040 Fax: (0440) 820281



VGASAT IV & MegaNOAA APT Systems

1024 x 768 x 256 Resolution and 3D

The Timestep Satellite System can receive images from Meteosat, GOES, GMS, NOAA, Meteor, Okean and Feng Yun. Using an IBM PC-compatible computer enables the display of up to 1024 pixels, 768 lines and 256 simultaneous colours or grey shades depending on the graphic card fitted. We actively support nearly all known VGA and SVGA cards. Extensive image processing includes realistic 3D projection.

100 Frame Automatic Animation

Animation of up to 100 full screen frames from GOES and Meteosat is built in. We call this 'stand alone animation' as it automatically receives images, stores them and continuously displays them. Old images are automatically deleted and updated with new images. The smooth animated images are completely flicker-free. Once set in operation with a single mouse click, the program will always show the latest animation sequence without any further operator action.

NOAA Gridding and Temperature Calibration

The innovative MegaNOAA program will take the whole pass of an orbiting satellite and store the complete data. Automatic gridding and a 'you are here' function help image-interpretation on cloudy winter days. Spectacular colour is built in for sunny summer days. Self-calibrating temperature readout enables the mouse pointer to show longitude, latitude and temperature simultaneously.

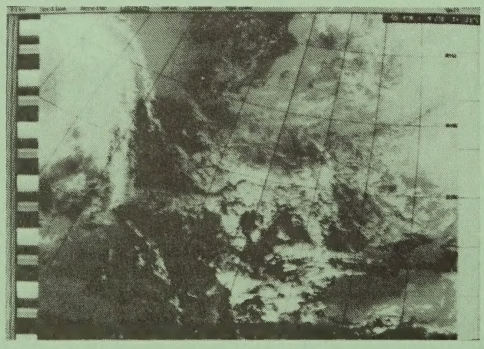
Equipment

Meteosat/Goes

❒ 1.0M dish antenna (UK only) ❒ Yagi antenna
❒ Preamplifier ❒ 20M microwave cable
❒ Meteosat/GOES receiver
❒ VGASAT IV capture card
❒ Capture card/receiver cable
❒ Dish feed (coffee tin type)

Polar/NOAA

❒ Crossed dipole antenna
❒ Quadrifilar Helix antenna (late 1991) ❒ Preamplifier
❒ 2 channel NOAA receiver ❒ PROscan receiver
❒ Capture card/receiver cable



Call or write for further information.

USA Education Dealer. Fisher Scientific. Educational Materials Division. 4901 W. LeMoyne Street. Chicago. IL 60651. Tel: 1-800-621-4769

USA Amateur Dealer. Spectrum International. P.O. Box 1084. Concord, Massachusetts 01742. Tel: 508 263 2145

TIMESTEP WEATHER SYSTEMS

Wickhambrook Newmarket CB8 8QA England Tel: (0440) 820040 Fax: (0440) 820281

What do I need for APT ?

As well as complete systems, Timestep allow you to buy all the parts separately. The quickest an least painful approach is simply to buy a complete system. Take your time and take advantage of ou RIG special prices (UK only), you will save some money ! The parts you will need assuming you are usin the IBM type PC approach are :-

Meteosat Meteosat is probably the best place to start. It sends images constantly. You could buy one of our ready to go systems, or you can buy the parts separately Remember you do not need a NOAA receiver if you use our Meteosat Receiver. This wi free your NOAA system to look for the Soviet polar orbiters, something every satelli enthusiast should be doing ! The Yagi is fine for most users, for critical applications the Dis is recommended.

Timestep products (world prices)	Britain	Europe	USA	RIG UK Members
1.0M dish antenna and feed horn	£199.00	N/A	N/A	£149.95
Yagi antenna	£124.95	£135.00	$149.00	£ 99.95
Meteosat pre-amplifier	£ 92.00	£110.00	$149.00	£ 84.95
20M cable	£ 16.00	£21.00	$ 33.50	£ 14.00
Meteosat receiver	£199.00	£225.00	$399.00	£169.95
PCSAT III interface card	£199.00	£225.00	$299.00	Henry Neale
PCSAT III connecting cable	£ 9.95	£ 9.95	$ 15.00	£ 6.49
Dish feed (coffee can type)	£ 29.95	£ 38.50	$ 49.00	£ 24.95

Pager Proof Receivers Guaranteed !

POLAR You have the choice of 2 receivers. Both have superior resistance to interference (mone and postage back guarantee). The 2 channel unit covers both NOAA's on 137.50Mhz an 137.62Mhz. The scanning receiver covers all known satellites including the complete Sovie series. NOAA receivers may be simply plugged into the PCSAT III, or NOAA and Meteos can be selected by using the switch box.

Crossed dipole antenna	£ 39.95	£ 55.00	$ 64.00	£ 29.95
NOAA pre-amplifier	£ 24.95	£ 31.50	$ 49.00	£ 19.95
50M cable	£ 24.95	£ 31.50	$ 68.00	£ 21.95
2 channel receiver	£149.95	£169.00	$199.00	£124.95
PROscan receiver	£299.00	£325.00	$499.00	£249.95
PCSAT III interface (as above)	£199.00	£225.00	$299.00	Henry Neale
PCSAT III selector switch box	£ 24.95	£ 24.95	$ 35.00	£ 19.95
Instant Track PC prediction	£ 24.95	£ 24.95	N/A	£ 19.95

All prices include VAT at 17.5% and carriage in Britain, and Air carriage to other destinations.

Timestep
Wickhambrook Newmarket CB8 8QA England
Tel. 0440 820040 Fax. 0440 820281